AMERICAN
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DEVOTED TO THE INTERESTS OF TEXTILE CHEMISTRY
BLEACHING • DYEING • FINISHING • PRINTING

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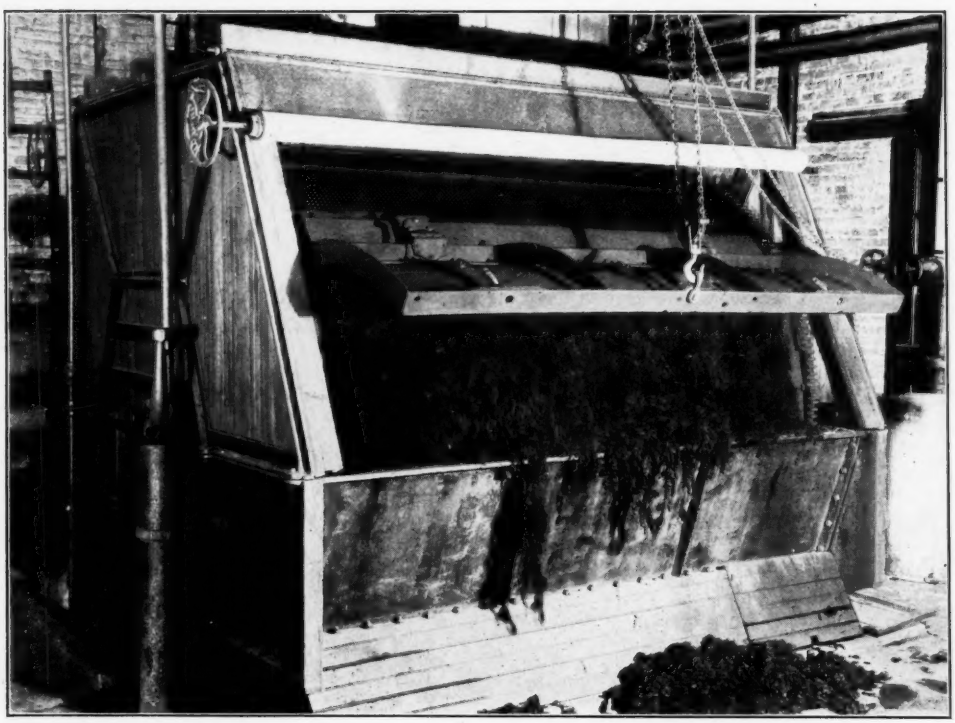

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Chemical Engineering Aspects of the Textile Industry*

By **RICHARD G. KNOWLAND**

Vice-President and General Manager, of the Bigelow-Sanford Carpet Company.

In this article the author lists the operations in which the chemist and engineer have affected changes. He further gives a description of those general classes of operations in which the influence of the chemical engineer is felt. A general description is given of the use of the various subdivisions of chemical engineering practice.

IN ANY discussion of the textile industry, one is immediately struck with the contrast which it presents to what we may term industries of modern origin. Textile methods in general were conceived many thousands of years ago and the arts of weaving and dyeing were well established centuries before technical methods or technically controlled processes became available. The textile industry also embraces much of craftsmanship as well as art. Since these elements are of foremost importance in the making of merchantable fabrics, it was not until recent years, when the urge of competition forced the use of more economical methods and the acquiring of hitherto unattainable effects, that a really scientific and technical background began to develop. In these respects, textiles share with the potters' art and with the leather industry the distinction of having added engineering and chemical methods as after thoughts, rather than having developed as a result of such modes of thought. Unless these facts are clearly borne in mind, the industry is likely to be put in a false light when its status from a scientific and technical standpoint is compared to that of any industry developed during the last century.

As to the functions of the chemist and engineer in textiles, their efforts have resulted in profound changes in those classes of operations which are listed below:

1. The preparation of fibers for processing.
2. Bleaching.
3. The dyeing of fibers, yarns and fabrics.
4. Printing.
5. The finishing of fabrics to confer useful and attractive effects.
6. The development of new dyes and chemicals.
7. The development of synthetic fibers.
8. The evolution of suitable testing methods for evaluating the relative resistance of fabrics to agents destructive to color or wear.

Since time does not permit any description of textile operations sufficient to afford a background, we shall have to plunge directly into a description of those general classes of textile operations which are affected by chemical engineering efforts. To this end, it will be assumed that only a general description is to be given of the use to which the various subdivisions of chemical engineering practice are put. In the interest of brevity, the details of operations peculiar to textiles will be limited so far as is possible.

I. Conveying Materials

Textile materials are conveyed mechanically in pipe lines by air, on belt-type conveyors, and by tractors. In the handling of raw wool or cotton fibers which have not been fabricated into yarn, air pipe lines are invariably used for all long distance conveying about the plant. Such distances may run up as high as 3,000 feet. The air velocities required for cotton or wool vary from 30 to 50 feet per second depending on conditions. Boosters are often employed on very long pipe lines where the losses from friction become excessive. Wet cotton may be conveyed by air, but wet wool of long staple cannot be thus handled because of its tendency to snarl and plug the line. Wet wool is usually conveyed by truck with or without trailers or by belt conveyors.

Cotton is carried for short distances by belt conveyor.

*Presented at the meeting of the American Institute of Chemical Engineers, Swampscott, Mass., June 10-12, 1931.

A typical case is in the cotton picker room where a single belt conveyor with gates properly located in side-walls which enclose the belt are arranged automatically to shunt the proper amount of fiber as required into the feed box of any one of a battery of machines. Bobbin boxes and packages of yarn or laps are frequently transferred from one department to another by belt conveyor.

Since modern textile plants are highly departmentalized because of the necessary lack of continuity in the manufacturing processes, the interdepartmental use of tractors and trailers for process or finished goods is common. This is naturally true of the larger plants in particular. In silk manufacturing, where the volume of materials so requires, use is also made of belt conveyors and of tractors.

In general, while the art of conveying textile materials is well enough developed, only a relatively limited number of mills are employing as economical conveying methods as they might. The cost of this operation, if fully allowed for, may be expected in an average mill to amount to about two per cent of the total cost of production. In stating such figures, by the way, for so varied an industry, and for units of widely divergent size, it should be understood that only an average figure is being attempted. In a large mill, however, the total annual bill for conveying materials is likely to run up to $200,000.

II. Drying

There are so many applications of drying in the textile industry that it seems wise to classify them as follows:

1. Drying of raw or dyed fibers
2. Drying of yarn in
   - *a*. Single strands,
   - *b*. Skeins,
   - *c*. Packages.
3. Drying of cloth while
   - *a*. Slack
   - *b*. Under lateral and longitudinal tension.

Before wool can be processed, it must first be "scoured" in alkali and soap to remove the grease and attendant dirt, after which it must be dried. Cotton which is raw-stock dyed must also be dried in the fiber. The method generally employed for drying such fibers is to distribute a uniform lap of the materials over a screen which travels through a dryer housing. In many cases several such screens are employed; in each case an upper screen discharges its lap on to the screens below which travel in reverse directions with respect to each other. Such dryers are usually heated by steam coils arranged at the side in boxes and circulation is provided by fans which withdraw air from the top of the dryer, pass it through the coils and then across the bottom of the dryer whence it is drawn upward through the screens carrying the fibers under treatment. Saturated air is extracted near the feed end of the machine and at the top. Automatic regulation ordinarily is not provided, although it should be. The degree of engineering skill lavished on most of these contraptions deserves little in the way of comment. One or two dryer manufacturers are now furnishing dryers, however, which afford a heat efficiency in terms of pounds of water evaporated per pound of steam of about 65 to 70 per cent. The average "raw-stock dryer," as encountered in most mills, has been found not to be good for over 45 per cent.

The chief limiting factors in raw-stock dryer design include a temperature not to exceed approximately 170 degrees for wool and not over 210 degrees for cotton if the fibers are discharged bone dry. If these temperatures are passed, wool is rendered harsh and yellow and cotton weakened in breaking strength. Wool should actually be discharged from the dryer with 8-12 per cent of regain and cotton with 6-8 per cent of regain. Consequently, in a properly designed and regulated dryer, taking advantage of the fact that the materials do not heat about the the wet bulb temperature within the dryer, and that the above final regains are required, the actual operating dry-bulb temperatures within the dryer may be considerably above 210 degrees for either wool or cotton; and this without injury to the fiber.

A vast amount of work remains for the chemical engineer in the way of revamping the innumerable inefficient raw-stock dryers in use or in designing more economical ones.

Skein-dryers are similar in general external form to raw-stock dryers. The skeins, however, are placed on poles which fit into chain conveyors and are then carried through the drying chamber. The circulation is provided from top to bottom by units of fans and the heating elements are located at the side or overhead. The better operated machines provide a gentle counter-current flow of air up the dryer and for exhausting the correct amount for most efficient operation. Some of the skein dryers as developed by two manufacturers in particular are capable of extremely efficient operation. In both cases, the material is dried well under the desired regain and then "conditioned" back in the final sections of the machine.

Temperature limitations are the same as for raw-stock. The air velocity in recirculation is important if tangling of the skeins is to be avoided. The limiting circulation velocity employed depends strictly on the density of packing because of this tangling effect. In skein drying, the factor of diffusion time must be allowed for, since the thickness of material in the bunches of yarn complicates the problems beyond that of the mere circulation of air.

It might be said that engineering principles have been recognized throughout in the design of the newer dryers. They are commonly used for rayon, silk, cotton and wool.

The drying of yarns in packages such as cops, cheeses, or on perforated beams is a gradually increasing practice. With the advent to common use of dyeing machines which force the dye liquor back and forth through such packages, drying methods naturally have evolved to permit unwinding of dyed and washed yarn in the dry state. These dryers are usually of the chamber type with the packages on racks or trays placed on trucks. In this problem, where diffusion time is the paramount factor and the matter of removing the moisture, as it diffuses to the surface, very simple, this type of dryer has proved efficient

when properly designed. In some package dyeing machines, subsequent to the after-treatments and washing processes, hot air is forced through the packages as a means of drying. This practice, however, is not general, and because of the high pressures required, is not economical.

Rayon, silk, wool, and cotton are all frequently dried in the package.

Yarn dryers are commonly used in which single strands are lead in sheets over drying cells, dry-cans or cylinders, or are looped through continuous, "hot-air," dryers. The overall steam efficiency in all except the loop dryers will run up to 80 per cent where cans or cells are well covered with the sheet of yarns and where other possibilities of heat loss are provided against. Good control and a well-designed dryer are required to attain a heat efficiency of more than 45 per cent in a loop dryer, although up to 70 per cent can be gained with careful control. Loop-drying obviously provides a softer and loftier yarn, desirable in certain fabrics.

Cloth is dried in the slack form in loop dryers. Generally, it is dried on cans or in the so-called tenter-frame. In the tentering operation a group of dry cans is employed first to reduce the moisture content in the cloth to from 15 per cent to 30 per cent of regain. The cloth then is seized automatically at each selvage in the jaws of the tenter-chains and drawn horizontally through a drying tunnel. Circulation of air is usually counter current and a series of high velocity jets of hot air are often employed throughout the length of the tunnel to force the drying medium through the pores of the cloth. The tenter chains gradually spread in the passage through the tunnel, becoming parallel about half-way through. While thus held and dried stretched, the cloth assumes its permanent "set" to the desired width. To maintain this "set" accurately, the cloth at exit should carry not over 4 per cent to 6 per cent of regain. The steam efficiency of the average tenter housing is about 15 per cent to 25 per cent. Consequently, good practice requires that the dry cans which precede the tenter should perform as much of the entire drying operation as will leave the cloth extensible enough for the final stretching and drying in the tenter itself.

III. Humidification

In the textile industry the humidification of rooms in which manufacturing operations are carried on is general. Cotton requires an atmosphere of at least 50 per cent relative humidity for good picking, 60 per cent for carding, 60 per cent to 75 per cent for spinning, and 65 per cent to 85 per cent for weaving. Woolen and worsted fibers pick and spin better when humidified; and 50 per cent relative humidity is desirable. Woolen operations, however, are not so sensitive to variations in humidity as are those on cotton. In the cotton industry, a drop in relative humidity of 20 per cent has been known to increase warp breakage in weaving to an extent sufficient to cut in half the number of looms which were being operated per weaver. Silk and rayon operations also require a steady and controlled humidity.

In the manufacture of rayon, from the time it leaves the spinneret, controlled humidity of about 60 per cent relative is required.

The functions of humidity are to prevent static, to reduce "fly" on the yarn, to increase breaking strength, to increase elasticity, and to decrease losses in the "invisible waste" which results from the snapping of dry and brittle fibers. As suggested specifically in the case of cotton, each operation works best at some perfectly definite relative humidity.

The function of atmospheric humidity is, of course, to establish on the fibers that percentage of regain most favorable to the particular operation at hand. Variations of more than plus or minus 5 per cent relative are detectable in their effects on nearly all textile operations where the regain is a factor. Closer regulation is desirable. Consequently, the regulation of room humidity must be absolutely automatic. The types of regulators employed include those which are membrane operated, and many types of wet and dry bulb instruments. Hygrometric controls are, of course, valueless. The sensitivity of control depends on the equipment available (its type and distribution of outlets and their capacities) as well as on the kind of building involved, on the distribution of the machinery, and on the number and locations of the regulators.

In the manufacture of rayon, central station equipment is generally used. In this system air is drawn through a spray chamber in which the temperature of the spray water is so regulated as to confer the desired dew point on the air. Fans then supply the saturated air to the respective rooms.

By the use of volume dampers and steam coils, both automatically regulated by dry bulb controls, very accurate humidity conditions at a reasonable dry bulb temperature can be maintained for each room, even though a different relative humidity is required for each room. The air, after circulating about the room, returns in ducts to the central station, where the necessary amount is rejected and sufficient fresh air drawn in to maintain a fixed temperature-humidity balance in the mill. This type of equipment is also frequently found in cotton mills. From four to five air changes per hour are general in this practice.

The unit system, so-called, is gaining headway. This "unit" is really a small central station with sprays, heaters, fans and regulators. Several units may be placed on a large floor. The humidified air is discharged well above the floor at high velocity, entraining a large volume of room air as it travels from the unit. A major advantage in the unit system lies in the ease with which units are added or removed if the operations in a given department are changed.

The so-called "head-types" of humidifying equipment include two chief varieties. In the first group are those known as turbo heads in which a jet of air ejects a fine

(Continued on page 443)

Developments in Dyeing With Azoic Colors*

By **H. BLACKSHAW**

RECENT developments in azoic colors and their application were surveyed by Mr. H. Blackshaw, of Imperial Chemical Industries, Ltd., in a lecture given before the Manchester Branch of the Foreman Dyers' Guild last month. It was the first lecture in which the two new azoic products, Duratol BA and Duratol Green G Salt, have been discussed.

Mr. Blackshaw said (*inter alia*):—

During the last five or six years the azoic colors have made most amazing progress. The number of individual products now available is very large and enables a most comprehensive range of shades to be produced. All types of red, scarlet, bordeaux, maroon, orange, yellow, blue, black, violet and brown may now be readily obtained.

Until quite recently the absence of a green was very noticeable but now even that gap has been filled. These dyes have made great advances from a utility point of view, and are now employed to a much greater extent and in a much greater variety of trades than was the case a few years ago. It might be said that to some extent they have created trades of their own, and enabled colors to be introduced on certain articles which would have been impossible to get with other classes of dyestuffs. Where can one find in any other range of dyestuffs for cotton or artificial silk colors to produce the same richness and beauty of shade obtainable by means of azoic colors? The answer is: nowhere, at anything like a comparable price or quality.

Progress Retarded by War

All new classes of dyestuffs are bound to make comparatively slow progress at first. I use the word "new" in connection with this series remembering that the war period cut off Continental supplies, and that the serious development of a full range of shades only commenced about 1923. Although the results obtained from successful application of these colors are extremely gratifying, I think I may be correct in saying that all of you who have achieved success have had many problems and difficulties to overcome.

In a dyehouse, no process can be successful until it has been studied and investigated at every stage, until every stage in the various processes can be controlled by the man directly concerned—and by that I mean the man actually on the machine. A process which constantly requires the attention of a highly-trained dyer or chemist is not popular in a dyehouse, and everybody tries as far as possible to avoid using it.

The Naphthols have now passed the experimental stage and have become a regular part of the business of a very large number of dyers and printers.

Although the application of these colors proceeds very smoothly, even the most experienced dyers find there are still some problems yet to be solved, whilst difficulties, often with attendant complaints, will occasionally arise.

I am now going to put before you a few observations regarding the application of these colors, and I hope they will be of interest. I propose to give a sketch survey of the dyeing process in relation to the various problems and difficulties which one often encounters. It is my opinion that only by a full appreciation of the influence of each factor in the various stages of preparing and dyeing the Naphthols that one can fully control the dyeing process.

Danger of Residual Lime

With regard to the preparing of the material before Naphtholating, I want to say a word about bleaching, namely, that residual lime, in those cases where a lime boil is used, can cause trouble, which is generally reflected in bad penetration or poor fastness to rubbing. The difficulty is caused by the use of Turkey red oil in the Naphthol bath, this oil being employed to facilitate solution and act as a penetrating and levelling agent. The Turkey red oil forms an insoluble lime soap which is not readily removed.

There are two possible ways out of the difficulty:—

(*a*) To omit the lime boil; if it is in the dyer's hands to do so.

(*b*) To use something in place of Turkey red oil which will not so readily form disagreeable lime soaps.

So far as the second solution is concerned, wetting-out agents like Perminal offer a useful alternative to T.R.O. Perminal can entirely replace Turkey red oil, or, if desired, a mixture of, say, 2/3 Perminal and 1/3 Turkey red oil can be used to minimize the risk of greasy precipitates, as Perminal possesses the property of dispersing lime soaps in a very finely divided state of division.

The question of Turkey red oil is very important apart from the matter of lime soap. It is my experience that the amount of T.R.O. should be reduced to an absolute minimum. In certain cases it adversely affects the stability of

(Continued on page 444)

* Dyer and Calico Printer.

Proceedings of the American Association of Textile Chemists and Colorists

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MAY MEETING OF NORTHERN NEW ENGLAND SECTION*

THE May meeting of the Northern New England Section of the American Association of Textile Chemists and Colorists convened Saturday evening, May 2, 1931, at 6:30 P. M., Chairman Henry D. Grimes presiding.

Chairman Grimes: We have tonight two speakers and at every opportunity we like to diversify the program and extend the interest over all the members. The first speaker is a man we are all acquainted with, he is a member of our Section, a member of the National organization, is a councilor and is going to be the chairman of the technical program of the National Convention in December. Dr. Scott, at present connected with the laboratory of G. J. Esselen, an organization devoted to chemical research and development, is going to talk about some unusual reactions of cellulose. Dr. Scott.

Dr. Scott: Mr. Chairman, Ladies and Gentlemen:

I am very glad that the chairman in his introduction mentioned my connection with the technical program, because it gives me an opening for a little propaganda in this connection. I should like to take just a minute or two to discuss the ideas that I have in mind for that program. It seems to me that a well-balanced program would result if every Section of the Association would take upon itself to have one or two members of the Section present a paper on some mutually interesting subject. That is, each Section would assume the responsibility for one or two papers. I have written to the chairman of each Section with that in mind, and, I understand that Mr. Grimes has appointed Mr. Hugh Christison of the Arlington Mills as the representative from this Section on the program committee. I think that is a very happy appointment for I know Mr. Christison will be of great assistance to me. What I want especially is to have every member of the Section think it over and decide whether they may have something of interest to present themselves, or whether they know of some other person who would be willing to prepare a worthwhile paper for the annual meeting. If any of you have any ideas on that subject, I wish you would give them to your representative, Mr. Christison, or to me personally. You can write to me at 73 Newbury Street, Boston, or phone me at Kenmore 1859 during business hours. I think that we have started in plenty of time to work up a very interesting technical program for the annual meeting. I hope we can make it one of the best we have had yet.

I will now proceed to a discussion of the subject which I have chosen for my talk this evening.

* Report continued from Proceedings Page 198, May 25th issue.

Proceedings of the American Association of Textile Chemists and Colorists

Some Unusual Reactions of Cellulose

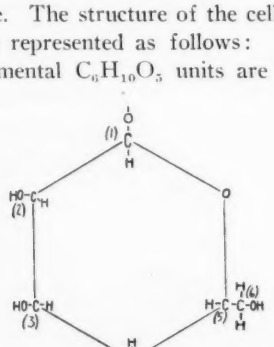
By Dr. Walter M. Scott

LESS than one hundred years ago not even the most brilliant scientists were able to visualize any higher mission for the well known substance of lowly origin known as coal, than to release its stored up energy in the form of heat for our comfort or as a source of power to turn the wheels of industry. And then in 1856 William Henry Perkin discovered "Mauve" and paved the way for the marvelous chemical developments which transformed an apparently useless by-product of this same coal into one of the most important raw materials for our present-day chemical industry. The romance of the coal tar colors has been told many times and is undoubtedly familiar to all of you.

Similarly, we have until very recently thought of cotton as a rather prosaic but extremely useful fiber whose chief destiny was to pass through a number of transitions—many of them physical and none of them chemical in the sense of producing any fundamental change in the chemical structure—until it resulted in the many fabrics both useful and ornamental which are grouped under the common name of textiles. And yet there have appeared during the last few years a number of significant developments which seem to indicate that in the not very distant future the romance of cellulose may equal or even surpass the romance of coal tar. As many of the recent discoveries in cellulose chemistry have a direct bearing on the cotton textile industry, I hope that my brief review of this subject will have some interest to you as textile chemists.

Even at the present day the complete chemical structure of cellulose has not been definitely established but very important progress has been made in that direction. It is now known that the basic group in cellulose is $C_6H_{10}O_5$ and that this group contains three free hydroxyl groups. It is possible to hydrolize cellulose completely to d-glucose whose empirical composition is $C_6H_{12}O_6$, and this gives rise to the assumption that cellulose is essentially an anhydro-glucose. The structure of the cellulose unit may conveniently be represented as follows:

These fundamental $C_6H_{10}O_5$ units are believed to be



The Basic Unit in the Cellulose Molecule

combined into chains of indefinite length, the units being held together by primary valence forces and the chains in turn being held together in bundles by the secondary valences of the oxygen atoms. There is considerable evidence to show that the chains are probably built up in groups of four $C_6H_{10}O_5$ units each. For instance, Malm and Clarke have determined that "in native cellulose one hydroxyl group out of every twelve is chemically different from the rest, being capable of esterification without the intervention of acid anhydrides or catalysts." Also Willstätter and Zechmeister have shown that with the aid of fuming hydrochloric acid it is possible to isolate three intermediate polysaccharides between cellulose and glucose. And then about a year ago Dr. A. J. Stamm applied to cellulose the new methods of determining molecular weight which had been developed by Prof. Svedberg. Using a new oil turbine type of centrifuge which operates at the remarkable speed of 60,000 R.P.M., Stamm determined the specific sedimentation velocity of cellulose in a cuprammonium solution, and also its diffusion constant. From these two quantities he calculated that the molecular weight of cellulose is 40,000 plus or minus 5,000. In other words, the cellulose molecule is believed to contain from 200 to 260 $C_6H_{10}O_5$ units.

Cellulose is a fibrous material and its molecular combination must somehow give it this fundamental character. In recent years the use of X-rays has developed some important evidence as to the arrangement of the cellulose micelles. In fibers such as cotton the micelles seem to be arranged in a regular oriented arrangement along the longitudinal axis of the fiber, the chains of molecules being also given a slight spiral twist. The regular arrangement or orientation of the micelles seems to be responsible for the strength of such fibers, since it is found that in rayon where there is only a random or hit-or-miss arrangement, the strength per unit cross-section is much less. As a result of this knowledge progress has been made in increasing the strength of rayon fibers by subjecting them during their formative stage, to external forces which tend to orient the micelles.

It is not my intention to devote much time to the developments which resulted in our present-day rayon industry as this is undoubtedly an old story to most of you. I merely wish to point out that of the processes which are in commercial use today only one results in a product whose chemical structure is substantially different from the original cellulose. It is true that the earliest process, which was originated in 1884 by Count Chardonnet, involved the formation of the nitric acid ester of cellulose. And yet this ester, as such, was never widely

used for the manufacture of filaments because of its inflammability. It was only with the discovery that the nitrocellulose could be hydrolized with the regeneration of the original cellulose molecule, that any extensive commercial development of this process took place. Also the so-called viscose process, while it includes the temporary formation of the unstable cellulose xanthate, does not result in a product which is chemically different from the original cellulose. The cuprammonium process is based simply on a solution of the cellulose in an ammoniacal copper solution and a subsequent precipitation without any chemical alteration. In fact it is only the more recently established acetyl cellulose process which actually results in a permanent alteration of the cellulose molecule. In this case a certain number of the hydroxyl groups in cellulose are caused to react with the carboxyl group in acetic acid to form an acetate of cellulose.

The acetate is the only ester of cellulose with which the textile industry is at all familiar and it may come as a surprise to some of you that more than fifty other esters have been prepared in various laboratories and their properties have been studied. Cellulose benzoate was first synthesized by Cross and Bevan in 1893 and various other esters were described by other investigators in subsequent years. However, it required the stimulation of the recently developed and enormously expanded lacquer and film industry to inaugurate intensive researches on this subject.

Within the last few years there has been developed an entirely new method for the esterification of cellulose which has the advantage of combining simplicity with efficiency. Cellulose or a suitable cellulose conversion product (such as hydrocellulose or reverted cellulose) is treated with the desired organic acid in the presence of chloracetic anhydride and a catalyst such as magnesium perchlorate. Curiously enough the chloracetic anhydride, while promoting the combination of cellulose with the organic acid in question, does not itself enter into the reaction at all. By means of this reaction, it is possible to prepare cellulose esters of all the fatty acids from acetic up to palmitic and stearic and also of many aromatic acids such as benzoic, salicylic, and phthalic, as well as derivatives of the same. In addition to the usual simple esters, various mixed esters have also been synthesized.

One of the applications of cellulose esterification with which the textile industry is familiar is the immunization of cotton. In this case cotton which has been first mercerized with NaOH, is esterified by a solution of p-toluolsulfochloride in an organic solvent such as carbon tetrachloride. The esterification takes place in layers from the outside and the center of the fiber contains practically unchanged cellulose. Immunized cotton is not in general affected by the ordinary direct dyestuffs but behaves more like an acetyl cellulose and may be dyed with the new types of dyestuffs developed for this purpose. Immunized cotton is said to have a resistance to water about equal to the waterproofing of cotton with aluminum acetate and soap. Amidated cotton is the latest development in this field. It is prepared by treating immunized cotton with ammonia or some organic base and although it looks like cotton even under the microscope, it has entirely different chemical properties. As a matter of fact in dyeing it shows an even greater affinity for the common acid dyestuffs than wool does.

Cellulose is capable of forming another series of compounds analagous to the esters. For example, if cellulose in the presence of caustic soda is treated with benzoyl chloride (C_6H_5COCl) the benzoic ester of cellulose is formed; whereas if the same cellulose in the presence of caustic soda is treated with benzyl chloride ($C_6H_5CH_2Cl$) and a suitable dehydrating agent, the benzyl ether of cellulose is formed. A large number of ethers have been prepared in the laboratory and their film forming properties have been studied. A mixed ether and ester of cellulose has also been described by the I. G. in a recent British patent.

Before leaving this subject I must not neglect to mention a new development which presents interesting possibilities to textile chemists. In a recent United States patent, the I. G. has disclosed a method for the preparation of sulfonated cellulose derivatives which in contrast to all the previously known esters or ethers, are soluble in water. A typical compound of this type is formed when cellulose is mixed with an alcoholic caustic soda solution and then treated with an alcoholic solution of sodium benzylchloride-para-sulfonate. The resultant sodium salt may be transformed into the corresponding acid by the usual transition through the calcium or barium salt. These new water-soluble cellulose compounds may be regarded as cellulose benzyl ether sulfonic acids. They are claimed to be incombustible and therefore suitable for producing fireproof films. Textile fabrics may be impregnated with water solutions of these cellulose sulfonic acids and then a metal sulfonate may be precipitated on the fiber by treatment with the salt of some metal such as aluminum.

In addition to its ability to form addition products such as esters and ethers, cellulose has the property of condensing with phenol to produce products of a resinous nature. These cellulose condensation products are relatively new and have not yet been thoroughly exploited but there is no reason why they should not take their place with the earlier known condensation products of phenol with formaldehyde. They make excellent solutions with various organic solvents such as alcohol, acetone, ether, etc., and are said to be useful for impregnating various fibrous materials such as paper or cloth.

Having visualized some of the possibilities of cellulose as a basis for building up new and interesting compounds, let us turn for a few moments to the consideration of

certain of its decomposition products. It has been known for a long time that cellulose could be hydrolized to a sugar and numerous attempts have been made to take advantage of this fact commercially. Up to the present time very little success has been attained along these lines but right now there are in Europe at least three responsible groups working actively on this problem. The hydrolysis is carried out with the aid of either dilute hydrochloric or dilute sulphuric acid and the sugars so obtained may be used as constituents of cattle-fodder or they may be converted by fermentation into ethyl alcohol.

Ethyl alcohol is not the only alcohol which it is possible to obtain by the decomposition of cellulose. Within the last few years considerable work has been done on the selective fermentation of corn stalks with the result that two other alcohols (butyl and amyl) are now being successfully produced on a commercial scale by this method.

The dispersion of cellulose in solutions of various reagents is another subject of interest to textile chemists. The discovery that cellulose could be dissolved in a cuprammonium solution has proven to be of practical interest to the textile industry of today and so any new possibilities along this line are of potential interest. Several novel methods of dissolving cellulose have been described within the last few years. For example, cellulose, or any of its derivatives or conversion products, will dissolve at room temperature in quaternary ammonium bases (such as tetra-ethyl ammonium hydroxide) with or without the presence of caustic alkali. Cellulose will also dissolve in ammonia derivatives of carbon dioxide (such as urea or its sister product thiourea) in the presence of caustic alkali at temperatures ranging from 0 to —10° C. The solutions thus obtained are said to be suitable for the manufacture of artificial threads and yarns as well as for various kinds of films and coatings.

Not content with being a monarch in its own domain, cellulose in the form of fibers has been a great imitator of other textile raw materials. Synthetic fibers of cellulose were first heralded as an artificial substitute for silk and it required a good many years before there was a general recognition that these synthetic fibers could be marketed on their own merits and under a name of their own. Even now the aim of research in this field is to produce a synthetic cellulose fiber which will correspond more closely to natural silk in its physical properties. A recent patent by the I. G. describes the production of cellulose compounds containing nitrogen by treating cotton with a mixture of caustic soda, alcohol and water, and then with a solution of a halogen cyanide (such as BrCN) in carbon tetrachloride. Filaments made from such cellulose derivatives are claimed to resemble natural silk more closely than the usual types of rayon.

Many attempts have also been made to produce a grade of cotton which would have a distinct wool-like appearance. Possibly the most interesting contribution to this subject has been made by Georges Heberlein of Switzerland. He has made a thorough study of the alteration in the physical character of the cotton fibers if they are treated without tension in caustic soda solutions of mercerizing strength. In a recent patent he claims that the most pronounced wool-like effects are obtained if the caustic solutions are allowed to act upon the raw cotton fabrics while they remain in the loose condition. For the success of this process it is essential that alkali boiling be entirely excluded and that if there is a cleansing of the vegetable fibers before or after the swelling treatment, it should be a very careful cleansing at a low temperature.

In spite of the fact that cellulose in the form of cotton has been used in the creation of textiles ever since the time of the early Egyptians, we are forever being surprised by apparent inconsistencies in its chemical behavior. For example, cotton manufacturers have for many years been taking advantage of the discovery of John Mercer that if cotton is immersed under tension in a strong solution of caustic soda, it will acquire greater tensile strength as well as added luster. We also know that weak caustic solutions even at a boil have very little injurious effect on the cotton fibers. And yet a few years ago the remarkable discovery was made that cotton will dissolve completely in solutions of caustic soda of from 4 to 10% strength if these solutions are cooled to temperatures around —10° C. Again, if cotton goods are immersed in stronger caustic soda solutions (at least 15° Be.) at 0 to —10° C., a permanent finish transparent effect will be produced upon sheer fabrics or a permanent linen finish will be produced upon coarse fabrics.

On the other hand, mineral acids such as hydrochloric and sulfuric have long been considered extremely detrimental to cotton and other cellulose fibers. We all have learned, sometimes to our sorrow, that if small amounts of even very dilute sulfuric acid are dried in a cotton fabric, the tensile strength of the fibers will be completely destroyed and it is quite likely that the cloth will disintegrate into a powder. Imagine our astonishment, then, when the well known Austrian inventor, Leon Lilienfeld, demonstrated that threads of much higher tenacity and greater luster may be obtained in the viscose process of manufacture if, after the usual coagulation in a weak acid bath, they are passed through a bath of strong sulfuric acid. This acid may be as high as 85% in strength although the best results are apparently obtained with an acid of 55% strength.

When we contemplate such apparent contradictions in the behavior of cotton toward the common alkalis and acids, we realize that there is some justification for the term "nature's paradox" which was applied to cellulose a long time ago. Personally, I feel that this brief presentation of the high spots in the chemical behavior of cellulose might well be prefaced by the caption which has been made famous by Ripley, "Believe It or Not."

Mr. Grimes: I am sure that after having our minds illumined on this subject of cellulose which probably very few of us realized had so many possibilities, we must have some questions which occurred to us during the presentation of the paper.

Mr. Zillessen: I'd like to ask Dr. Scott if the amidated cotton is commercially available?

Dr. Scott: Amidated cotton is not yet on the market. I understand that it is still in the development stage.

Mr. Zillessen: You say it has an affinity for acid dyestuffs. What will happen if it is used for union dyeing?

Dr. Scott: In dyeing, amidated cotton will have to be distinguished from regular cotton just as acetate rayon must be distinguished from other rayons. If it should be marketed under the name of cotton there is likely to be trouble. However, I imagine that it will be some time before it is put on the market at a reasonable price. It is still in the stage of experimentation and the cost of production is still very high.

Prof. Olney: Is there a cellulose formate and how does it compare with the acetate? Could a satisfactory rayon be made from it?

Dr. Scott: Experimental lots have been produced but there has been no commercial development. It is quite probable that fibers of cellulose formate do not possess as desirable qualities as fibers of cellulose acetate. As a matter of fact, in spite of the extensive research work on a large number of cellulose esters, the acetate and the nitrate are the only ones which are being used in commercial quantities at the present time.

Mr. Zillessen: Are any of the cellulose condensation products on the market?

Dr. Scott: I am not aware that there is yet any commercial production of these products although the patent was granted about two years ago.

Mr. Lincoln: Can immunized cotton be hydrolized?

Dr. Scott: It is practically impossible to convert immunized cotton completely back into regular cotton by hydrolysis. However, prolonged treatment in alkaline solutions will hydrolize it sufficiently so that it will not be completely resistant to the direct cotton dyestuffs.

Mr. Davies: Does it hydrolize equally with acids and alkalies?

Dr. Scott: I understand that it is not as susceptible to hydrolysis with acids as with alkalies. The ordinary kier boil in a caustic soda solution has the most detrimental effect of any of the usual dyeing or finishing processes.

Mr. Grimes: I am surprised that more of you do not desire further information. Perhaps you will ask other questions privately a little later on.

Mr. Grimes: Our next speaker is from the Rodney Hunt Machine Co. He is going to speak on Recent Developments in Wet Finishing Equipment. I am not sure whether any of you have met him as a speaker before or not, but quite a number of us have met him personally in his field of business and endeavor. Mr. Homer C. Riggs.

Recent Developments in Textile Wet Finishing Machinery

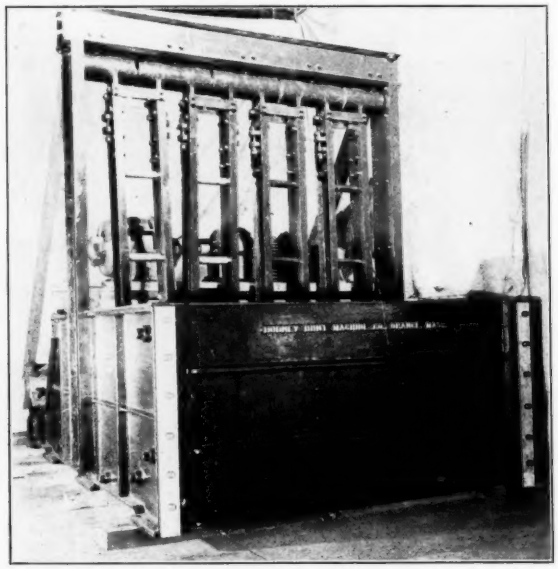
By Homer C. Riggs
Rodney Hunt Machine Co.

I AM going to tell you about some of the more recent Developments in Textile Wet Finishing Machinery, particularly in connection with those machines with which I am most familiar, namely, Fulling Mills, Washers, and Dye Kettles.

I expect there may be some little controversy about some of the statements that I am going to make, and I am going to vary your usual program a little, by suggesting that anyone who has any questions, or takes exception to anything that I say, do not hesitate to interrupt, and we will have a discussion as we go along, rather than save it until the end. I hope there will be many questions.

I have with me a number of photographs, which show some of the machines that we will discuss, and I thought you might like to pass them around while I am talking. These photographs will perhaps give you a little better idea of the details of these machines, than the rough sketches that will appear on the blackboard.

The first machine is the Fulling Mill, the function of which you all know. In the old days, in very ancient times, the original fulling was done by tramping on the goods with the feet. The cloth to be fulled was put into a box, together with some water and soap, or other ingredients, such as Fuller's Earth, and was walked upon until the desired amount of fulling was accomplished. The next step in advance was the substitution of a square block equipped with suitable handles, in place of the feet, this block being used to pound or tamp the cloth in much the same manner as the men working on the highways today tamp block paving. A logical development after that was to connect a machine to the tamping block handle with a crank or eccentric motion to raise and lower the



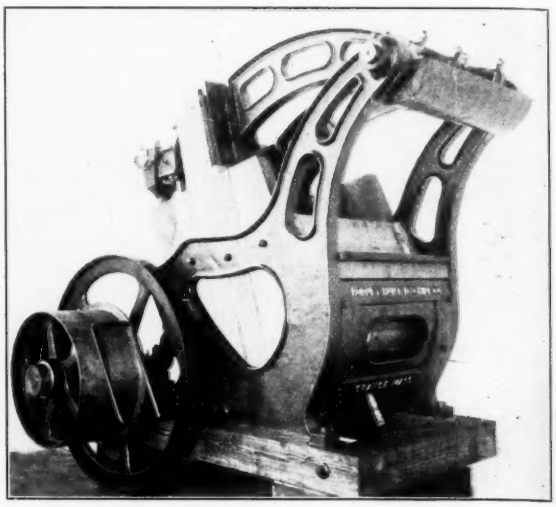
Iron Frame Pusher Fulling Mill

block. This development gave us the Falling Stock and Pusher Mill, which were the first types of machines for fulling fabric.

Now, in all of these older types of machines, the only control which was had over the rate of fulling, or the relative percentages in width and length, was simply by means of the layout of the cloth in the loom, and particularly with reference to the character of the yarn, whether it was of a soft or hard twist, and the type of wool used. The next step in development was the introduction of the Rotary Fulling Mill, with which you are more or less familiar. In this type of machine probably 90% of the fulling in width is done between the main rolls, and 90% of the fulling in length is done in the packing or crimping box.

In fundamental design the Rotary Fulling Mill has undergone very little change up to the introduction of the Express Fulling Mill about three years ago. The object of this improved mill was to place in the hands of the finisher easy, convenient, and effective means of controlling the rate of fulling, both in width and in length, and at the same time provide him with the means of accurately controlling the character of the felt produced as well.

All of these things have been accomplished in Express Fulling Mills. You will notice on the picture of the Express Mill, which is among the photographs which you are passing around, that the usual porcelain or brass pot eye for front guide has been replaced by vertical rubber covered rolls. These rolls are readily adjustable, so that the space between them can be narrowed down or increased at will. Note also that the usual wagon springs, instead of fastening to the mill in stationary brackets, are

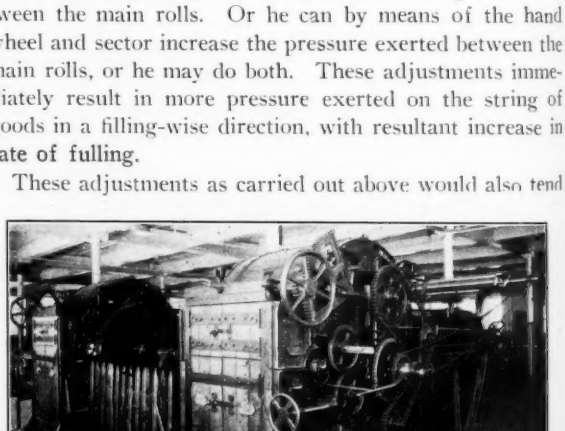


Crank Bumper

joined to bell crank levers, and these in turn are carried by a system of levers to a sector gear, pinion, ratchet and hand wheel.

It should be borne in mind that in order to produce a fulling or felting action we must have three factors present—heat, moisture, and pressure. In the Express Fulling Mill, then, if a man is running a piece of goods or a set of goods which he finds is not coming up in width as fast as he would like to have them, he can immediately change the conditions governing the fulling to compensate for it. He can by means of suitable hand wheels adjust the verticle front rolls so that they are closer together, thus subjecting the goods to a greater crushing action between the main rolls. Or he can by means of the hand wheel and sector increase the pressure exerted between the main rolls, or he may do both. These adjustments immediately result in more pressure exerted on the string of goods in a filling-wise direction, with resultant increase in rate of fulling.

These adjustments as carried out above would also tend



Express Fulling Mill

to produce a softer and more spongy felt, for the increased pressure and "working" of the goods tends to break down the yard to the core and produce a softer spongy fabric.

It is at this point that the matter of heat enters into the proposition, and we know through recent experiment that if the temperature of the mill is not allowed to increase, adjustments such as the sample just given can readily be made without disturbing the character of the felt produced. Undoubtedly temperature has more effect on the character of the felt, whether it is soft and spongy, or hard and boardy, than any other one thing, and it is a fact that soft felt is produced at a high temperature, and a hard felt at a low temperature.

All of the controls on the Express Fulling Mill are fitted with indicators or dials, so that when satisfactory settings are once obtained they can be duplicated at any time whenever the same fabric is being run, and the same finish desired.

As to the fulling in length, it has always been since the introduction of the Rotary Mill, more or less under adequate control. That is to say, the system of levers which press down on the packing or crimping box cover, have been provided with either a series of weights, or with sliding weights on a lever, so that the amount of pressure exerted could be adjusted. However, no accurate control was ever used, for the reason that in setting on the weights they might be put on 18" from the end of the lever one time, and only 6" from the lever at another time. In the Express Fulling Mill the packing box lever is divided off into equal spaces, and each space numbered, so that it is possible to set the weight accurately from set to set, and also in duplicating runs of goods. The counter weight is also provided with a marked scale.

Most of the features of control which have saved so much time, and increased the quality of fabrics, also lend themselves to adjusting the conditions in the mill, so that light, medium, and heavy weight goods can be run in the same machine with equal facility by making the proper adjustments. As I remarked a little while ago, one of the greatest factors in influencing the character of the felt produced is the temperature at which the mill is run. While finishers and mill men in general have always known that temperature exerted a very marked effect on the fulling, it is only within the past year or two that any attention has been paid to the actual temperature used, and until within recent months no attempt has been made to regulate this temperature automatically. We know, for instance, that in making certain mechanical felts if we run the temperature up to 110 degrees, or higher, such as would be perfectly proper for a cotton warp shoddy woolen, we get a very soft spongy, open fabric, entirely unsuited to its purpose. Therefore, on all finishes requiring a dense, boardy, hard felt, it is necessary to run at a low temperature.

As an example of what I mean, I have in mind a mill that has specialized in mechanical felt for many years. If you go there today you will find them running their fabric in single draft for a period of from 12 to 14 hours, and sometimes even then they have to take them out, scour them, given them an acid treatment, and put them in for additional fulling. They say that it is the only way that they can get the finish which they want. They will agree that they could run the fabric triple draft, or double draft, and speed up the fulling and cut down the time required, but they would answer your question by saying that "if we do that we will get a felt which is too soft." They are not taking into consideration the increase in temperature due to the double draft, and the fact that it is this increase in temperature which has given them the softer felt, and not the fact that they are running triple draft.

We know that this same type of goods is being successfully run in Fulling Mills triple draft, and have no doubt but that quadruple draft could be used with equal facility, and with even better production results. In this mill the temperature is kept down to not more than 90 degrees, and the goods are taken out in six or seven hours, instead of 12 or 14 hours, and are actually a better grade of felt. Most experienced men can put their hands on a piece of goods in the mill and tell whether it is too hot or too cold for the character felt which they want, but there are very few who can tell within 10 degrees as to just what the temperature is. And, how many can duplicate this temperature in another run?

Just within the last few months we have put on the market a temperature control for Fulling Mills. This is arranged so that a proper ventilating unit is on the top of the Fulling Mill, and ventilates the mill by drawing the warm air up out of it. The usual old style way was to open the doors whenever the operator felt that the goods were too warm. Usually the operator would go away, and tend to other work, and then when he came back he would find the temperature had gone down below the desired amount. He would then close the doors, and the chances are that the temperature would again rise above the proper degree. We have found from actual experience that the thermometer under such conditions as this will vary from 10 to 15 degrees, so that after all it is not surprising that consecutive sets of goods from the same Fulling Mill, fulled under apparently the same conditions, do not have exactly the same finish. There are many other features in the modern Fulling Mill which are more or less mechanical in their nature, and which are taken more or less for granted in a modern machine. I refer to such things as cast iron packing box frames, spring operated knock off, galvanized pipe pin retainers, Allegheny metal and Monel metal fittings, anti-friction bearings, roller chain, disc clutches, motor drives, unloading rolls, etc.

This unloading roll is a matter which has not received

proper attention in the past, and it is suggested that the next time you go through the fulling room that you see what back-breaking work unloading a Fulling Mill is, particularly on heavy goods. The up-to-date fulling mill has a power driven roll, which eliminates this hard hand-work, and incidentally saves half of the unloading time.

To sum up the major points, then, the modern Fulling Mill has every feature affecting the fulling of the fabric adjustable, and each one of these devices is fitted with proper indicator and scale, so that duplicate settings can be made at any time. Many mills are using a Fulling Mill data sheet, such as the sample among the photographs which you are passing around, which has columns for many more things than the old time finisher ever suspected had anything to do with the felting of the goods. This Fulling Mill record is being used in quite a large number of mills today, and in some of them they carry fulling data so far that knowing the construction of the cloth they issue instructions to the fulling room as to just what temperature to run at, just what pressure to use, just what nip opening to apply, and just how far apart to set the vertical rolls which act as front guides. They can predict the fulling time under a different set of conditions within a very small percentage, and can also forecast the finished thickness of goods so fulled to within a few thousandths of an inch.

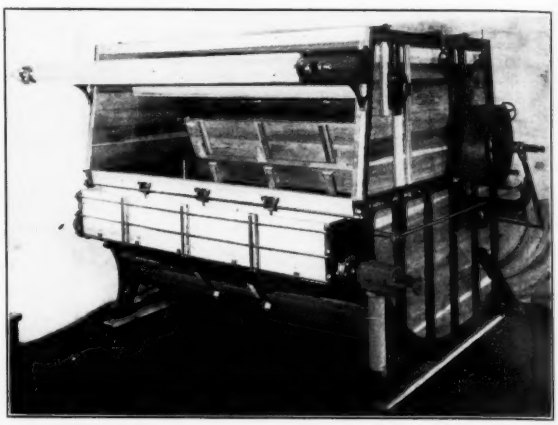
In all of the above discussion I have not mentioned soap, although I am not losing sight of the fact that the character of the soap, the way it is made up, the consistency and temperature at which it is applied, has a very vital effect on the fulling, since it affects one of the three cardinal conditions, namely moisture content. There are probably as many soap mixtures for each kind of goods as there are finishers running that type of goods, and it is sufficient to say here that the soap should be of a heavy enough body and of proper character so that it will not break down during the fulling process, and should be applied in sufficient amounts to lubricate the cloth thoroughly, and help to emulsify some of the foreign matter, and to loosen up the dirt, so as to aid in the scouring process.

Mr. Grady: Is the temperature regulated by the rapidity of travel or by the pressure?

Mr. Riggs: The temperature in any Fulling Mill is generated entirely by the friction of the goods as they pass between the rolls, and as they are pushed through the packing boxes. Thus the temperature at which a Fulling Mill will operate depends both upon the rapidity with which the goods travel, and the amount of pressure to which they are subjected. Ordinary speeds are generally based on the revolutions of the main rolls, and vary between 100 and 150 R.P.M.

Mr. Grady: You would say good quality fabric will run at a lower speed than cotton warp shoddy goods?

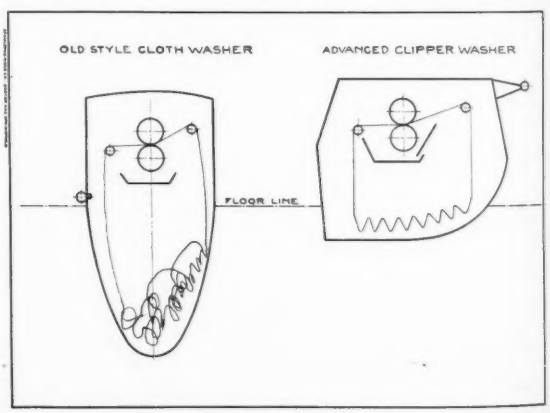
Mr. Riggs: A good quality fabric will full nicely at a much lower speed than that required for cotton warp shoddy goods. In the latter case, particularly if a low grade shoddy is used, it is absolutely essential to run the goods at as high a speed as they will stand, and at as high a temperature as the dyes in them will stand, in order to get them to full up quickly. After a certain point is passed if they have not fulled up enough, it is useless to full them any longer, as they will simply wear away, and if continued long enough will fall apart.



Advanced Clipper Washer

The next machine I want to talk about we have christened the "Advanced Clipper" Washer. This is a subject which ordinarily is very interesting to dyers, particularly in view of the ancient controversy between dyer and finisher as to whether a set of goods which is off shade has been thoroughly scoured.

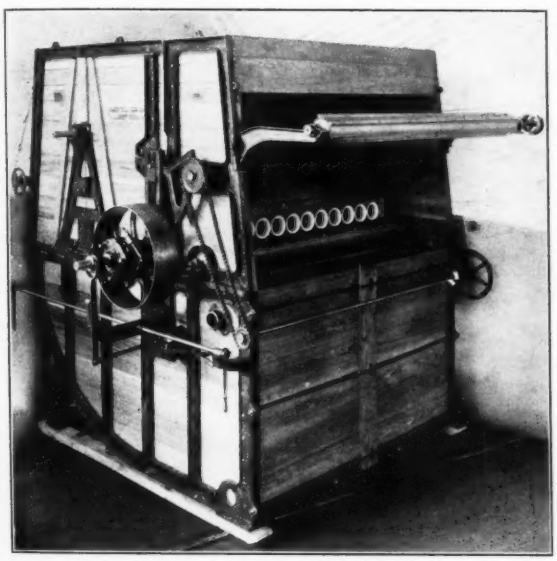
The shape of the ordinary washer, as you will recall, is something like this sketch. It is comparatively deep, and not very wide from front to back, with a shape of tub in which the goods are bound to pile up and topple over to a greater or lesser extent. Almost invariably the string of goods in rising at the front of the machine is pulling from under a bunch of fabric, and the goods as they lie in the



Difference in Style of Washers

tub are not in an open, loose condition, as they should be. In bringing out the Advanced Clipper Washer we made a radical departure in the shape of the machine. Instead of having a machine that was narrow and deep, we have a tub which is nearly 10 ft. from front to back, and only about 5 ft. deep. The result is that the goods lie in the bottom of the tub in a more uniform, open and loose condition, and at no time will they pile up and tumble over and form bunches of fabric. They are absolutely free, and in a much looser and more open condition. The liquor in the tub can circulate more freely, and much more uniform scouring is obtained.

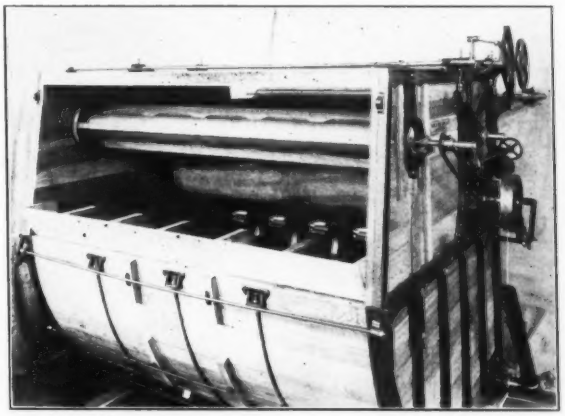
In any washer the efficiency of the rinsing has a great deal to do with the efficiency of overall operation of scouring, and unless that rinsing is properly done, your scouring never can be correct. The function of the suds box under the main rolls is to carry away the dirty water squeezed out at the nip, and carry it off to the sewer. Now, in the old style suds box the sides of the box came up relatively about like this. They were approximately



Advanced Clipper Washer With Counter Current Flow

four or five inches deep, and we found that by actual test about half of the dirty water squeezed out of the goods spilled over the sides of the suds box, and went back down into the tub again, and therefore prolonged the time of the rinse, as well as running the danger of uneven work.

One of the first things we did in developing the Clipper Washer was to extend the sides of the box on the front and back. As some indication of what happened, the old washers had a drain in the end of the suds box, which was about 3 x 5". This was ample to take care of the water caught out, and in making the newer box a 5" diameter drain was put in, but it was found to be much



Showing Counter Current Partitions and Crossovers

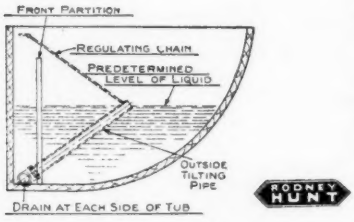
too small. It took two 5" diameter drains to carry away the water which was caught by the new style suds box as against one 3 x 5" drain being sufficient to carry away the water caught by the old style suds box. Surely this in itself tells a very impressive story of the efficiency of the rinsing in these two types of washers.

To date we have had some very excellent reports on the performance of this washer, one mill reporting a saving of 40% in their scouring time, another reporting a saving of about 1/3 in the amount of soap used, another reporting double capacity from a machine only 2' longer than the older type, and with this double capacity, using no more water to get the goods clean than they previously used for one-half the amount of goods.

One of the things which has helped to get better rinsing was the sheet spray manifold. Looking downward on the old style manifold, we found that it was constructed something like this, with a nozzle in the center of each space, supposedly opposite the string of goods. This nozzle was supposed to shoot the spray onto the rope of goods as it came up through the ladder guide. As a matter of fact, it did it only a part of the time. The nozzle being fixed and in the center of the space, a majority of the time the rope of goods moved about so that the clean rinse water did not strike it at all. The new sheet spray manifold has a continuous nozzle or slot the entire length of the machine, so that when water is introduced we have a spray or sheet of water coming from the manifold across the entire length of the machine, so that no matter where the string may go, or how it may twist, it cannot escape the stream of clear, clean water.

On the old style washer the final drain was known as the slide gate type. It was simply an iron gate operated by suitable levers. Happily for the peace of mind of mill owners, these washer gates were always beneath the floor where they could not be seen, so that the amount of good hot water and usable soap suds which leaked through without doing its proper duty, was never fully

known. The new type of drain we call the level control type, and it is absolutely impossible to plug it or have it leak as there is no slide at all. This drain is simply a piece of pipe with suitable elbows and packing glands, etc., introduced at the bottom of the tub. The pipe swivels about the horizontal position, and is operated by a cable and hand wheel. When it is desired to empty the machine, the tilting pipe is lowered to the horizontal, or just below the horizontal position, and the water rushes out from the machine. When it is desired to maintain any other level, the pipe is set to the proper operating level for the goods being run, and there the water level will stay, regardless of how much may be added. If a man turns on the water and goes away and forgets it, no damage will take place, for the water will run out of the open mouth of the pipe as fast as it is introduced to the machine. In the old style of washer this would have resulted in a very high water level with consequent damage to the goods.



Level Control Drain

Dr. Chapin: Why don't you put an electric contact on that, and have some kind of an arm on there, so that if it should run over it would shut the water off?

Mr. Riggs: Once the level is fixed it can't get any higher, but an electrical contact such as you suggest might be added in order to save waste of water, which is the point you wanted to bring out I presume.

Question: In changing the shape of the washer, have you changed or increased the pull on the cloth?

Answer: We have decreased this very much, reducing the stretch considerably. Just recently a mill was trying to make a very heavy shoddy overcoating, and found it impossible to retain the fulled length. For instance, he fulled it up nine inches by the head, and when it was all scoured, in the old type of washer, it had stretched out eleven inches, so that it was two inches worse off than when it came off the knitting machine. We took it to an Advanced Clipper Washer, and after scouring it was still up seven inches, so that it lost only two inches in the process. This will give you a practical comparison of the amount of pull on the cloth in the two different types of machines.

Question: Do you think your water level makes a difference?

Answer: It certainly does in both machines.

Question: What do you think of a rinsing pipe, such as used on the German type of machine? What do you think about it for rinsing goods quickly?

Answer: I think that with this type of suds box it has more value than it did previously. I think that with the old style it didn't make any difference.

Question: I understand you introduce the water below?

Answer: Yes, we do ordinarily.

This new suds box in addition to having the high sides, is a non-leaking construction, for it is a fact that all previous suds boxes which had drains through the center of the bottom, leaked, whether they were made by us or anybody else. We tried a dozen different designs to get them so they would not leak. Our final solution was to make the box solid all the way, with no opening, and to run it up higher, and to put in each end a two-way drain, with a disc valve rubber packed, and an operating handle on the outside of the machine. When goods are running in the soap, this valve is adjusted so that the water can go back into the tub, and when rinsing it is moved to the other end of its travel, so that the dirty water is allowed to pass out to the sewer. Another method of introducing the water into the washer is increasing in favor. A water box is put on the back or curved side of the machine, with cast end frames, each with a flanged opening, one for hot and one for cold water. Between this water box and the tub of the machine are slotted openings, which are up about 12" from the bottom of a water box which may be 18" in depth.

This has a distinct advantage in the rinsing of some types of fabrics, particularly open, light weight, high twist woolen fabrics. In cooling off after the hot water rinse, with the ordinary type of manifold, the stream of water particularly in the winter time striking the hot fabric, causes the goods to shrink up and thereby affecting the finish somewhat. Many finishers will tell you that the mechanical action of the stream of water striking the goods causes it to full, but this is not the true explanation. With the water box on back the water does not strike directly onto the goods, but enters the tub where it is combined with the warm water, so cooling the whole mass of goods much more gradually.

As on the Fulling Mill, the unloading roll on washers has not been given enough attention. Many mills are now using them, but still others prefer to pull them out by hand. In a recent installation of two machines equipped with Doffer rolls, additional machines were ordered without them, because the operators preferred to pull the goods out by hand as they had always done.

Mr. Grady: Give us some of the reasons for washing wrinkles.

Mr. Riggs: This is a subject that I would rather not say too much about. For I think there are as many reasons given for wrinkles, as there are wrinkles, or nearly

so. However, wherever a wrinkle occurs, whether it is from a Fulling Mill, a Washer, or a dye kettle, there is one thing that you can be sure of, and that is that the goods have been run continuously in the same folds for a considerable length of time, and that while running in these folds they were subjected to heat and pressure. In looking for the sources of wrinkles, if these facts are borne in mind, the solution of the trouble will often be simplified.

Certainly undue pressure in a washer is conducive to wrinkles, and in our judgment the proper pressure to apply (unless some unusual effect is sought) between the main rolls of a washer, is just enough to move the goods through the machine without undue slippage.

Recently a mill making men's wear had considerable trouble with washer wrinkles. An investigation disclosed that the under half of the top roll bearings had been removed, and that the top roll was running directly in contact with the lower roll, so that not only the weight of the roll itself, but the spring pressure also, was exerted on the goods. The replacing of the bottom half of the top roll bearing, and the proper adjustment of the set screws underneath these bearings, promptly eliminated the trouble?

Question: Were they wrapped?

Answer: No, just plain rolls. In that case after we put the set screws back, the rolls were adjusted so that they were 1/8th of an inch apart, and the wrinkles disappeared.

Question: Would you say high temperature should be avoided?

Answer: Yes, I believe so. We have recently conducted experiments in a mill where the goods were very susceptible to wrinkles, and they ran a temperature of around 116 and sometimes as high as 130. Today they are washing their goods with water not over 90 to 95 degrees, and they have eliminated their washer wrinkles entirely. Sometimes washer wrinkles are caused by packing the goods too closely in the tub of the machine, and the Advance Clipper Washer eliminates this source entirely, as the goods have a chance to open up.

Mr. Grimes: What temperature do you recommend for scouring and rinsing?

Mr. Riggs: It all depends on what you are trying to get out, but in general I know of only one or two mills who use water above 110 degrees Fahrenheit. The lowest temperature that I know of being used for washing is about 90 degrees. In some cases mills are using a very high temperature on goods in order to remove such foreign substances which will not melt at the lower temperature. This is a dangerous practice, and I believe that some sort of solvent, such as gasoline, or a similar compound, should be used for these foreign substances which are of an oily or tarry nature.

Question: What temperature do you recommend on piece dyeings?

Answer: Not over 110. I think you can scour with water 110 or 112 unless you have something in there. The tendency is, as I find it, to lower temperatures all the time in washing.

Mr. Grimes: Is that for efficiency, or because they can't get the hot water?

Mr. Riggs: Sometimes it certainly is because they can't get the hot water.

Just one more thing in connection with washers, this time with the usual type of bleach house washer, which is known as the log roll washer or the dolly. It consists essentially of a pair of rolls above, and one or more pit or tub rolls below. The goods are entered into the machine, threaded through it spirally in continuous rope form, and they are usually run at a speed of from 100 to 250 yards per minute.

The important part of this machine is the tub, for it is here that the scouring or washing takes place. The usual type of bleach house washer has a tub possibly 5 ft. deep by 4 ft. or 4 ft. 6" wide, and of course the length is governed by the length of the machine which is usually 6, 8 or more often 10 ft. The water in tubs of this sort is usually entered at the same end that the goods leave, and in this way it is called a counter-current flow tub. The shape of the tub all in one compartment is such, however, that there are literally hundreds of cubic feet of water going through that machine which never by any chance come in contact with the goods.

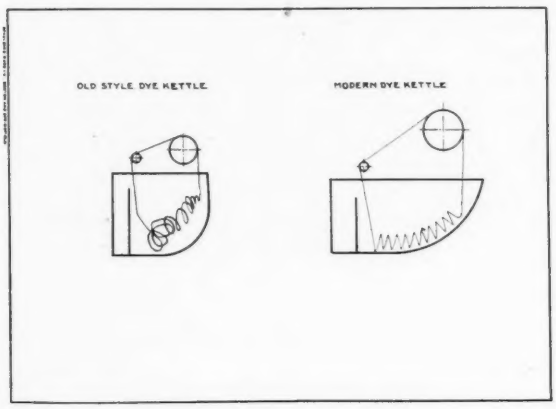
In order to effectively apply this counter-current flow principle, we have developed a multiple compartment tub for use in connection with bleach house washers. The water enters No. 1 compartment, and goes into No. 2, then to No. 3, and so on, while the goods enter No. 3 compartment first, then pass into No. 2, then into No. 1. In addition to making counter-current flow, these compartments are laid out so that the water enters the bottom of No. 1 compartment, leave at the top of No. 1, then flow over the top of No. 2 and enter No. 3 at the bottom, and finally overflow the final compartment at the top again. Thus, a sort of cross counter-current flow is obtained with a really remarkable saving in water.

It is not unusual to see a bleach house washer with a 4" or even a 6" pipe under 8 or 10 lbs. pressure. A counter current flow type of washer will wash goods better than the ordinary type using only about one-fifth of the amount of water which the older type requires.

No discussion of this sort would be complete without mention of dye kettles. They fall under four general heads, kettles for woolens and worsteds, for knit goods, rayons, and silks. With the exception of silks, these machines vary from one another, principally in the matter of overhead rigging such as the reels and rolls. The tubs

for the most part remain of the same general construction, although sizes and types will, of course, vary according to individual conditions.

In the old days a dye kettle was a dye kettle, and was made in the same shape for almost anything that came along. For instance, a standard old type dye kettle measured about 6′ from front to back, and was about 6′ deep, and had a length dependent upon the size of the



Difference in Styles of Dye Kettles

load which it was required to carry. With the present-day tendency to longer and longer cuts, the 6′ from front to back dye kettle is obsolete, and modern kettles for woolens and worsteds particularly, are seldom less than 8′ 8″ from front to back, and are perhaps more usually 9′ 5″ from front to back.

This new design of tub gives a much better chance for the goods to open up and move about and change folds, therefore assisting in securing uniform dyeing. It avoids piling up and tumbling over, with the resultant ill-effects, and offers chance for a more vigorous circulation of the liquor.

A new development is the inclusion of a canopy or house top built in as an integral part of the machine. This takes the place of the old-time hood, which was put up near the ceiling, and does a much better job of ridding the dye house of steam and vapor. A new idea is to equip the front and back of this house-top with canvas doors, which roll up and down with a wood roll at the bottom, operation being accomplished by means of a hand wheel; and through a suitable chain with hooks the roll can be fastened in any desired position. Usually this is carried completely closed on the back of the machine, and up high enough on the front so that the operator can observe whether the strings are traveling properly or not.

The level control drain mentioned in connection with the Clipper Washers is of as much advantage on dye kettles or even more, than it is on the washer.

In order to have uniform dyeing we must have uniform temperature throughout the dye kettle. This means first that the heating coil must be of a suitable design, and second that the circulation must be free and thoroughly vigorous. The type of heating coil which we have found gives best results under widely varying conditions, is shown by this sketch. Steam comes down the center, branches and goes both ways, then comes back with two perforated pipes, each running opposite to the other, and extending the full width of the machine. In this way where one steam coil delivers the most steam, the other delivers the least, and uniform boiling condition is obtained across the full length of the kettle. In kettles as long as 15′ we have found the variation from side to side to be not more than one degree, while the variation from front to back seldom exceeds 6 or 7 degrees with this type of coil, and the newer types of machines.

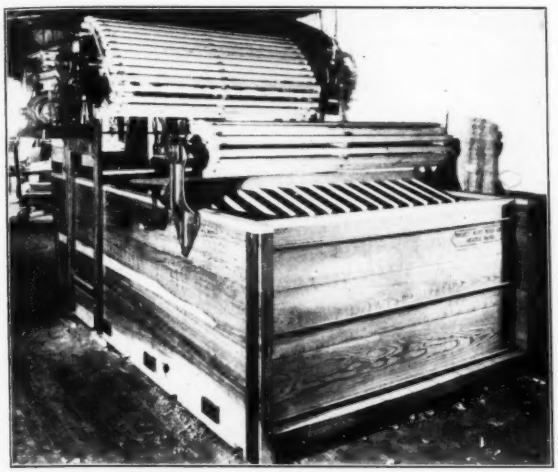
As an aid in securing vigorous circulation, the holes in the perforated steam pipes should be elevated somewhat from the horizontal, and they should be looking toward each other. This gives an ejector action, and the only danger is that if the holes are pointed too nearly the vertical, the ejector action will cause such a vigorous circulation as to pull the goods into the openings of the front partition or false front, and cause tangles and tie-ups. We have found that from 30 degrees to 10 degrees from the horizontal is the normal range for proper work, with the average being nearer the low limit than the high.

In the old style dye kettles the usual type of front partition or false front, was a plank with 1″ holes bored on 4″ centers. This was often called a baffle plate, and in actual use that is exactly what it was—it baffled the circulation. The new type of front partition looks not unlike a picket fence with a rail at the top, and a rail at the bottom, with a round bar about 2″ diameter spaced 2½″ on centers. This allows a very free interchange of the liquor from front to back of the kettle, and is a surprising aid in securing uniform dyeing from piece to piece.

Not long ago a certain mill in New England was having a large number of seconds from their kettles. They had the old style front partition with the 1″ holes. The elimination of the old baffle plate, and the installation of the picket fence type of partition, practically eliminated their trouble.

One dyeing woolens and worsteds, the usual type of reel is either six or eight bar, either of the open spider or the drum construction. The front roll is usually of the single type, and is not driven. For cotton and wool, and mixed knit goods, the usual type of reel is the three-bar folding or plating type, while the roll equipment is ordinarily of the squeeze roll type in which the bottom squeeze roll is driven. For the rayon and silks the usual reel is the oval slatted open spider type, while the front roll may be a single round roll, or a slatted reel.

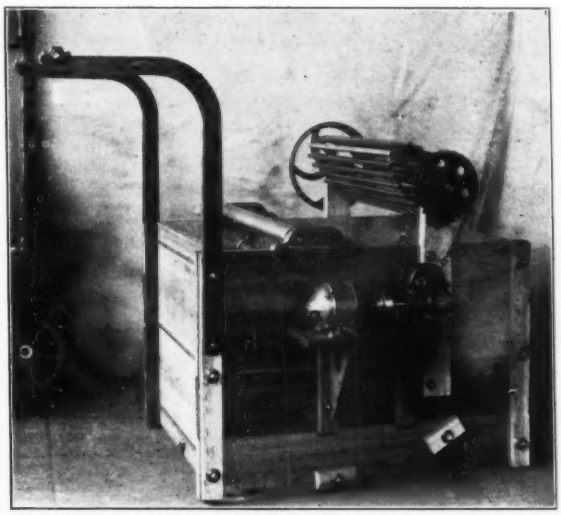
A new development in connection particularly with rayon and rayon and cotton mixtures, is the Tandem type of front roll. Here two rolls about 9" in diameter are placed on 11" centers, the centers both being at the same height above the top of the tub. This leaves a space of about 2" between the rolls, and the goods as they pass up from the tub pass over the front Tandem roll and up the back Tandem roll, and thence over the reel. Both front and back Tandem roll are positively driven. This imparts a forward motion to the goods, and helps greatly in securing proper running while the machine is threaded spirally, and at the same time it eliminates a source of possible trouble or damage due to the elimination of a nip or squeeze between the roll.



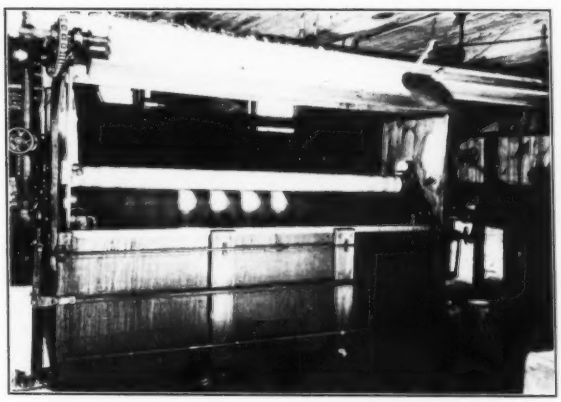
New Silk Dye Beck

The standard type of silk dye beck has been a rectangular shaped machine measuring approximately 10 ft. from front to back, and about 30" deep. It has the oval reel ordinarily, and a single front roll, not driven. The fundamental design of this machine has not changed in scores of years, and it is only a recent development that has effected a remarkable saving in steam consumption and cut down the time required for dyeing. A simple change in the construction of the bottom of this type of tub, eliminating the 25% volume of liquor which was not used, and did absolutely no good, has brought about this improvement.

The matter of use of stainless metal is about as interesting and modern a subject in connection with dye kettles as anything else. There are two metals in general use, Monel metal and Allegheny metal, or a similar chrome nickel iron alloy. Our experience leads us to believe that the stainless steels are far superior to other stainless metal today, especially as far as woolen and worsted dyeing is concerned where acid or chrome colors are used. On cotton dyeing with direct colors sulphurs, etc., the other types, such as the Monel metal, and similar alloys, seem to be perfectly all right.



Sample Kettle Lined With Stainless Metal



Dye Kettle Lined With Stainless Metal

There are at least three mills in New England which have conducted extensive experiments on various types of metals and other kettle linings, and have found the stainless steel to be far superior to all others, in that there were fewer colors actually unaffected by the stainless steel than by any other one material. In one mill a comparison showed the stainless steel to be next to the glass in trueness of shade.

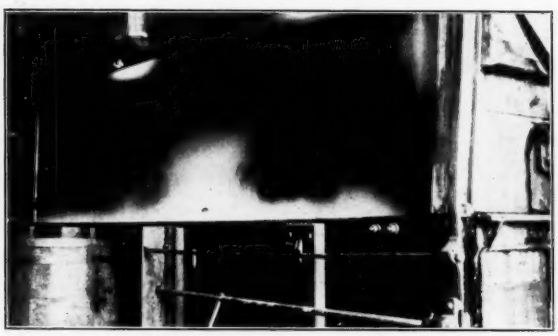
Mechanically there are two general ways of building stainless metal dye kettles. The older method was to build a wooden dye kettle, and to line it with a thin metal lining, making the reel of cast metal with either wood or metal bars.

The new Tru-Shade dye kettle eliminates the wood construction entirely, and while retaining the usual solid cast iron frames, has the tub portion made of plate metal, which may be 1/8 or 3/16" thick. The front partition

steam coil, pin rail, pins, reel shaft, spiders, and bars, are all made of the stainless metal, and the front roll may be either rubber covered, or it may also be a small reel-like construction of the same stainless metal.

The inherent value of a kettle of this construction is of course its ability to change from a dark to a light shade quickly and economically, and in addition a kettle of this construction should last a life time, for there is nothing to wear out except the bearings.

Another new and interesting feature in connection with the Tru-Shade dye kettle is the type of reel which is being furnished. This is a combination slatted and hump reel, with the humps mounted in suitable fashion so that they can be removed from the reel in a half hour's time, which leaves the reel free to operate as the ordinary type



One and One-Half Tons of Worsted in One Kettle

of slatted reel. Thus on the same machine it is possible to dye goods which require a hump reel, and then with only a half an hour's work to change the machine so that it will handle goods which should be dyed over a slatted reel.

I thought you might be interested in hearing about a 50 piece dye kettle which has been in operation some four or five years. The mill in question handles plushes and has five of these 50 piece kettles. Each kettle is a multiple machine, and is in reality five 10 piece kettles hooked up with a suitable circulating system, and proper receivers, etc., for mixing the dye and shading, etc. The system is patented, and I believe would be available to any mill which would have use for it through payment of royalties, etc.

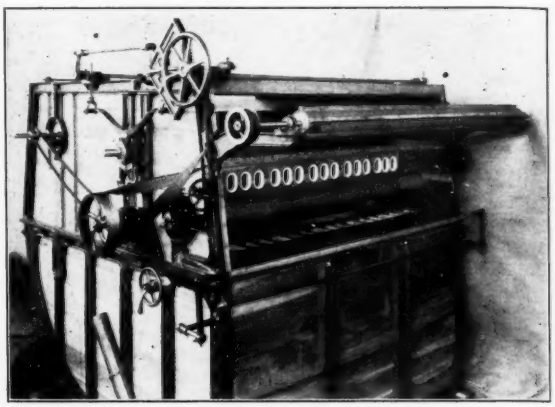
Another large dye kettle is a single unit, which holds normally about 2400 lbs. of goods, and under certain conditions has run successfully as high as 3000 lbs. of fabric. The mill in question has run this machine on worsteds, cotton warp worsted, cotton woolens, and all woolens. Although the machine is 15 ft. long, very wide from front to back, and quite deep, it has operated for over three years with a very small percentage of uneven or unsatisfactory work. The type of steam coil, the design of the tub, and the vigorous circulation maintained, are responsible for the nearly ideal conditions under which this operates.

Question: How do they scour those different sets?

Answer: Those are scoured in different machines. They scour as many as they can, which would be half or 2/3 of the load.

Mr. Grimes: How do they maintain an equal distribution of heat 15 ft. across the front?

Mr. Riggs: By proper design of the steam coil and front partition, as well as shape of the tub. All of these, combined with a very vigorous circulation.



Combination Washer and Dye Kettle

I have not said anything yet on continuous washers for woolens and worsteds. We are at present associated with a mill who has used continuous washers for a number of years. The machine appears to operate very satisfactorily, and has handled goods as heavy as 32 oz. overcoating. The production is one piece about every four and one-half minutes, and the economy of water and soap is very much better than the ordinary batch method of scouring. I am not at liberty to disclose details of this machine at the present time, but suffice it to say that it works, and will probably be available sometime during 1931 for installation in interested mills.

I have one more machine which I think will interest you, particularly the dyers. It is a combination washer and dye kettle. A year and a half or so ago I was in a progressive mill, and the Manager asked me why we couldn't make a single machine which would both scour and dye woolens and worsteds. I told him I didn't know why it couldn't be done, but said that I presumed there must be some objection, for the combination of these two operations seemed a fairly obvious thing, and as far as I knew it had never been done. However, we were both optimistic about the possibilities, and as a result several different designs were drawn. One of these was finally selected and built, and after it was in operation several changes were made, so that today there are some half dozen of these machines in operation, and every one

of them giving mighty satisfactory results. They have handled worsteds and woolens, cotton warp worsted, cotton warp woolen, and all cottons such as cottonade. The machine is used to first scour the set of goods, and then the set is dyed, and then speckdyed without removal of the goods between operations. There is of course a very considerable saving in time and labor of loading and unloading, sewing up and ripping outseams. In addition there is a considerable saving in the time of getting a set of goods through the mill, since the goods have no opportunity to lie about the room in trucks between the scouring and dyeing operation. In these days of rush deliveries, this is a considerable item.

In one mill they reserve all of their light shades for this combination kettle, because they get better and more uniform dyeing. I think the answer to this is in the scouring, and feel that the shape of tub which this machine has lends itself much better to more thorough and uniform scouring than the conventional type of washer.

One thing, the combination kettle surely does and that is eliminate any controversy between finisher and dyer as to whether the goods have been properly scoured for the combination washer and dye kettle is invariably run by a kettle man.

Question: From your experience would you say there was any advantage or disadvantage as to having the partition perforated on the lower half, or would it make any difference? I'm thinking of the scum that would flow in the overflow pipe.

Answer: The type of partition which you mentioned is new to me, but I do not see that it would make any particular difference. The usual way of caring for the scum which accumulates on the surface of the kettle is to cut slots through the kettle at a point say two or three inches above normal liquor level. Then when the dyeing is completed, or when it is desired to remove this scum, the kettle is simply flooded and the scum will go out the slot skimming the surface of the water. It is impractical to try to remove scum through a drain at the bottom, since it simply settles down onto the goods.

Question: Do you have to remove the iron before bleaching?

Answer: Well, opinion varies, and I am sure Mr. Grimes thinks you would. Nevertheless I know of a number of peroxide bleach kettles which are heated by galvanized iron pipes. After a few batches have been run the pipe is coated with silicate, and apparently causes no trouble whatsoever. In addition you are all familiar with the fact that in cotton goods bleaching a very considerable quantity of goods are bleached by hydrogen peroxide in the ordinary kier which is, of course, made up of boiler iron, and all of the fittings pertaining to the kier are also of iron.

Question: Don't you make the steam coils also of Allegheny metal?

Answer: Yes. In the Allegheny kettle everything is Allegheny.

Question: How about the speeds on that combination kettle?

Answer: No, we do not change the speeds which might be desirable. The speed is governed by the dyeing operation. We could scour at a faster rate than we do.

If there is no more discussion I think that is all I had planned to say. Thank you.

The Practical Side of Dyeing and Finishing Textiles*

By Ben Verity
American Printing Company

MR. PRESIDENT, Gentlemen: I commenced work at Walpole, Mass., when I was about eighteen years of age. One of my first problems was analyzing Sulphite of Soda. I found we obtained erratic results. I wondered why. I followed the standard work on Quantitative Analysis by Fresenius, the authority in those days, and still the results were not satisfactory. The instructions were to use boiled distilled water and titrate with iodine. To overcome the difficulty I thought this: If the Sodium Sulphite is combining with the oxygen in the water why not put the iodine in first so that the Sulphite will have the iodine to oxidize it instead of the oxygen? I put the iodine in the boiled water, dropped in the crystal of Sulphite of Soda, stirred vigorously always keeping the iodine around the crystal in excess and thus obtained uniform results.

A few months afterwards while looking at one of the old journals I found that some other worker had had the same difficulty and overcame it in the same way.

We used to make Sodium Sulphite by mixing Sodium Bisulphite and Sodium Carbonate. When you mix these together you get Sodium Sulphite, and you might

* Presented before the April meeting of the Rhode Island Section.

also have Bicarbonate or an excess of Sodium Bisulphite, and to find out whether it was neutral or not took quite a little time. It was necessary to boil for some minutes and then test it for neutrality, but you could not tell by indicators whether the mixture was neutralized or not without boiling. In this connection I will show you an interesting experiment which enabled us to tell at once if the mixture was acid, neutral or alkaline: This is water here. I will put in some Bisulphite Soda, and some Sodium Carbonate and Methyl Orange indicator. I will now add some neutral Hydrogen Peroxide, it instantly turns red. This shows there is an excess of Bisulphite Soda. The reason for this is that Sodium Acid Sulphate is formed. If too much alkali has been added it will remain yellow.

If anyone who dyes vat colors wishes to find out if they have sufficient caustic soda in the dyebath without analyzing it to take care of the acidity that will be formed in dyeing, take a few drops of the dyebath and then some neutral Peroxide of Hydrogen and finally Methyl Orange and if it is short of alkali it will turn red; if sufficient caustic is present it will turn yellow and will also give a deep pink with Phenolphthalien.

We used to make dry fused Zinc Chloride for soldering salts. It would go brown on keeping on account of the iron which was in it. The customer wanted it to keep white. The problem was how to get the iron out of the Zinc Chloride. At first we separated it as you would in a laboratory and obtained a very colloidal, bulky precipitate of Ferric Hyrate. This is Iron Oxide precipitated from acid Zinc Chloride in the ordinary way. It is flocculent. Then see this: notice how heavy and dense it is; it is precipitated from a basic solution of crude Zinc Chloride. These did not work out as well in the laboratory as they did on a large scale, which is not an unusual experience. When we had a 500 gal. tank of Basic Zinc Chloride liquor and precipitated the iron in solution by boiling with chlorate of soda, the iron oxide precipitated was so dense that by the time one went to the laboratory and back again to test the solution and see if it was free from iron (about five minutes) it had settled perfectly clear on top. Also when it was being evaporated in a lead tank until it reached a gravity of 135° Be., it would settle, in that dense liquid leaving the chloride of zinc clear like water.

At one time I remember the workman came into the laboratory quite excited. He was evaporating this white zinc chloride in a porcelain-lined iron dish. He said, "Mr. Verity, it has gone as black as your hat." I suspected at the high temperature that Manganese Salts were present and Oxide of Manganese had been formed. I thought, if that is so, a little Bisulphite will bleach that as it bleaches your hands after being in permanganate. I put a little in. the black mass changed to a beautiful translucent white.

About this time I read a book by Gad, on soap. A little book for students, used in the technological examinations in England. It mentioned the use of an indicator called Lacmoid, something I had never heard of before, and Watts' dictionary gave a method for making it.

Soon after that we had a shoe blacking to analyze. It contained borax, shellac, Carnauba wax, olive oil soap, nigrosine, and an acid yellow. You can understand that one color there that was not easy to get rid of, as a nigrosine dyebath does not exhaust easily. Borax is not usually considered the simplest thing in the world to analyze. Before receiving this sample I read a very interesting method of analyzing or titrating borax just as readily as caustic soda and Sulphuric Acid. If you take 50 cc. of Borax Acid solution and put in it the same volume of glycerine: Another 50 cc. I will put in the same volume of water. I will now put phenolphthalein in each and you will notice that when I titrate with Caustic Soda that in one case you obtain a sharp reaction in the other you do not. You cannot titrate Borax Acid in a water solution, but if you have over 33% by volume of glycerine you can analyze it. (Adding) you will notice this will have a sharp reaction (turing pink). That takes 7.5 cc. of Caustic Soda Sol. Titrating the Borax Acid in water solution, notice how indistinct it is, how gradually the pink color is produced. I add 1 cc. caustic soda. 2 cc. is about as dark as the other. Having read this about Borax Acid and Lacmoid I was able to analyze the mixture easily.

Then I went into a print works and I will tell you my first experience there. I saw a book in the office "Finishing of Cotton Fabrics." I had never been in a print works and did not know anything about finishing. I asked the manager to allow me to take it. He said "Yes."

I always had had the impression that ultramarine blue was an individual chemical and I had never read of ultramarine green or violet. I learned that ultramarines were a class of bodies of various properties and that some ultramarines were more sensitive to weak acid than others. I had been there about two weeks and a shirt came back from Montreal. It had been printed with a mixture of ultramarine blue and chrome green and albumen; it was the usual method of printing in those days. One-half of the printed shirt had turned green, the other half had not changed. It was still blue. Being a newcomer I was not responsible. The superintendent was called on the carpet and suggested that some bad albumen had been used. "Well," said the manager, "Why did you use it?" etc. I said to the superintendent "Will you let me have that shirt?" He asked, "Do you think you can find out anything about it?" I said, "I don't know; I am willing to try." Having read about this blue which was fresh in my mind I found they had bought a new kind of ultramarine blue. I asked if they had any of the old lot left and they said, yes. I made up color from both and printed them.

Then exposed both colors to acid starch paste which the customer had sent us showing what starch paste they had used on the shirt. The new ultramarine blue decomposed with the acid starch; the old did not. The manager was delighted that he could turn the claim back upon the customer because he used acid starch when he should have used neutral starch.

The present method of discharging para red was not known thirty-five years ago when I went into a print works. Here are two samples of para red discharged. I remember this coming out very well. I might say para reds were usually illuminated by resist methods. This was the first discharge, it was produced with a mixture of Tin Crystals and Ammonia Sulphocyanide. It discharged the para red very nicely except it had this peculiar property: That in a heavy stripe the cloth would be tender right on the edge of the print. The center of the print was pretty strong, stronger than the edge; it varied somewhat but always more tender on the edge than the center. Why was it tender on the edge and not elsewhere? This cloth was treated to prevent the tendering; I can hardly break it (showing sample). This is the warp of the goods.

When I was in the chemical works we had to analyze liquid wood stains. When they were in solution it was not very easy to find out what coloring matter was, but you may have noticed sometime if you put a solution of a mixture of colors on blotting paper and let it gradually spread you get a zone of clear white like water, then a zone of one color and a zone of another color and you can cut those zones out and test them by color reactions to determine the colors used. This is an example of Indigo Carmine and Methyl Orange, showing you the zones. The idea was that in the print the tin crystals crept out a little further than tin Sulphocyanide. Just like on color will creep out further than another. Tin sulphocyanide does not tender the cloth; tin crystals do. The next problem was how to overcome that. We did it in the following manner: We prepared the whole of the cloth with ammonia sulphocyanide and when the tin crystals crept out it always met some ammonia sulphocyanide, and no tin crystals could be on the cloth without being in the presence of sulphocyanide. That prevented the tendering and we produced discharged Para Reds that way without tendering the cloth. Sulphocyanic Acid is almost as strong as Hydrochloric Acid.

When I went to the American Printing Company I thought I knew how to make para red and so I essayed to show the dyer, Mr. John Sullivan, how best to do it. I told him, "You make it your way and I will make it mine," and when we came to test them his was much better than mine. The only difference as far as I could make out was this: He put in the strong Muriatic Acid and boiling hot water simultaneously on top of the dry paranitraniline and this para red after neutralizing I have seen keep a week in a wooden bucket and still dye a fair red.

In testing para reds the question sometimes arises: "Have they been made correctly?" You can test a para red with potassium iodide paper if the test paper is made in a certain manner. The top strip is ordinary potassium iodide starch paper; the next strip is potassium iodide paper made with ½% soda ash and 1% potassium iodide and starch. With the latter paper you can tell very closely the point when you have sufficient Acetate of Soda. At one time I sent someone to tell me how many gallons of Acetate of Soda it took to neutralize a batch of paranitraniline. It was about three times the quantity that should have been necessary. I went to test it and could not do so, much to my surprise. Then I found that the iodide paper had been made without the soda ash. If you neutralize paranitraniline with just sufficient Acetate of Soda you can print it with starch paste and it will keep fairly well, but if you have excess Acetate of Soda it will decompose the starch paste much more quickly. If you print with starch paste it means a saving of ten cents a gallon, over using Trag. paste as thickener.

About eighteen years ago we went into the plain shade business and one particular lot of Calcutta Indigo had *only* 70% of seconds. What was the matter? Of course, when dyeing indigos marks or stains on one side were thought to be caused by the indigo vat. But other colors began to show marks also where no scum was present. So the question was: "What was the cause?" We tried new kiers. The bleacher had several unpleasant interviews with the superintendent, that didn't stop the stains. About that time in England Professor Lamb found out that the markings on dyed silk were due to friction and that the fine fibrils of silk standing up had an optical effect like pile on cloth or a corduroy or a velvet compared with a plain cloth. It was conceivable. If that was the case, that in cotton a smiliar action was taking place. A piece of cloth was taken to try out that theory. In the first place, they said the stain was always on one side—true, it was—but it was not always on the same side. They forgot that—maybe only one or two stains in a double cut. To prove what was the trouble I took a piece of cloth and rubbed it in one place with a file, in another with sand and a third place with glass and scraped it elsewhere with a knife. Then I folded it and stamped it inside with letters, "File," "Sand," etc., and took that piece of cloth, doubled it up and sewed it with the marks inside. We took the cloth put it in a bag and bleached it in the kier and then opened it up and dyed it. When it was dyed with a sulphur color the friction marks were perfectly clear. Before doing the above experiment we put a bag in the kier and marked which was the outside and the inside, and exposed it to the friction on the sides of the kier, then dyed it. You could see the friction

marks at once. This is a piece of cloth one side bleached against the kier; hold it in a certain light and you will see the friction marks (passing samples around). When we found out what was causing the stains, then it was up to the bleacher to prevent them; this he did successfully.

By draping the kier on the side with a piece of cloth the cloth to be bleached never touches the side of the kier. All the friction is taken up by this cloth lining and that lasts about a week. Soon after that the war broke out and we dyed about a million yards of khaki per week. We found out what was causing the stains just in time.

Some of you probably have run mercerizing machines and have trouble in dyeing. Only this week I saw an account of the dyeing of mercerized yarn and it stated the mercerizing was uneven. It may be true but I doubt it. I think the trouble was uneven washing. Professor Hubner of Victoria University, Manchester, England, wrote an interesting article on a research of washing and dyeing of mercerized yarn and the uneven results obtained therefrom by different methods of washing. You would naturally think that if you mercerized two pieces of goods alike and washed them in various ways, removed all the caustic, soured, washed and dried that they would dye alike; but they do not. When I read that article I was not in the mercerizing game, but it was so clear and interesting I thought that if I have to mercerize any goods in the future I will know what to do. Luckily I had read that article. Here is a sample of a piece of mercerized cloth marked "longitudinal marks." The other side is perfectly smooth. That was washed by water falling directly down on it. To prevent the stripe effect have the wash water fall on some rags or other material to break its force and spread the water on the cloth in an even film and the trouble disappears. Where you have clip marks; you have uneven mercerization. Why? The clips coming around have water on them, because the water on the clip and the caustic soda on the cloth form a solution lower than the mercerizing strength and it does not mercerize at that point. How to remedy it? Simply wash your clips with the caustic soda that you use for mercerizing and drain the washings into the mercerizing mangle and nothing is wasted.

When Atcheson made artificial graphite he had a problem—how was he going to mix it so that it would settle?

He had read about an ancient race making bricks without straw. He wondered whether it was a myth or not. He took some straw water and added it to clay; he was surprised at the physical effect it produced. Then he investigated the streams of the country and found that where the water drained from forest areas it had an action on clay and tended to keep it in suspension and as he moved further away there was less action. So he made some straw water and added it to his graphite. It deflocculated it and held it in suspension.

When it came to dyeing vat dyes I asked myself, why shouldn't dyes be deflocculated like Atcheson's graphite? They are (holding sample). Here is Blue BCS deflocculated with Monopole Oil and a Colloid. The particles are so fine that they are not easily seen under a high power microscope.

We had been dyeing Vat Blues for probably six years, when suddenly, some time ago, we had trouble. We naturally wondered what had happened. When we used dry hydrosulphite we obtained a good color; when we used the hydrosulphite we had been accustomed to use the result was poor. You will notice the difference; one is bright the other is dull. We found out that the people who supplied us with color had changed it.

After reading Dr. Draves' article on the dyeing of Ponsol Blue BCS I was surprised that we had not experienced difficulty in dyeing this color up to that time. But soon after that the trouble started.

I thought our friend, Mr. Lord, would be here tonight. Sometime ago I asked him for a vat navy. He told me what to use. Instead of getting a navy I obtained a normal blue. I couldn't produce the correct shade. I looked in the literature and it said you had to boil it. You can't soap print cloth in a print works at the boil conveniently. I did something else to it and produced the correct shade. Mr. Lord asked me how I did it. I said, "That is a secret; you come to the meeting on the 24th and I will show you how it is done." It was obtained by steaming the goods through an ordinary print works steamer, which does not cost much and it is much more convenient than rope soaping at 212° F.

Question: In bluing with ultramarine blue, how can you tell when you have got the right one, some do turn green?

Answer: If you mix with a cold solution of alum some will decompose and some will not. That is one method of distinguishing between ultramarines. I don't remember how strong the alum must be, probably 5% will be satisfactory. You will find some will smell more than others showing more decomposition.

Question: You would think the alum coming through would throw some of those ultramarines blues out.

Answer: Certainly; I don't know about basic alum.

Question: Is that due to impurities in the alum?

Answer: No, the alum is acid enough to decompose some of the ultramarines. The name ultramarine covers a class of bodies—they are produced by fusing together sulphur, clay, soda ash and charcoal. A combination of aluminum silicate and soda and sulphur is formed. It is difficult to tell just what they are but they have different properties.

MAY MEETING OF NEW YORK SECTION*

Dr. Harold: I would like to know, or to borrow the experience of some present, if they have any suggestions as to what are the causes of streaks in acetate warps? I am sure the question is a little complex. There may be more than one reason but I have seen a number of cases that could be explained by no one assignable cause, and I would like to know if I have really been introduced to all the causes. In many cases it is attributed to unevenness in the tinting employed. That often goes on rather streaky but as it is a dye that comes out with cold water, it can hardly be blamed. The streaks seem to be due to a surface aspect of the fabric along the warp rather than any impropriety in the way the acetate takes the dye. It is a moot question and I would like to hear from any that have had experience along those lines.

Mr. Herrmann: It is limited to the warp? Suppose you had an acetate filling, would you see it?

Dr. Harold: I haven't seen it.

Mr. Springer: I wonder if the question of unequal tension has been considered. Is it possible that that might have an effect?

Dr. Harold: Yes, I have heard it given as a cause. In fact, I have heard it said that acetate furnished on half-pound spools is all wrong, that it always necessarily makes an entirely different tension if it is matched up on the same beam with acetate that has been furnished on two-pound spools. I don't know what there is in that, but the difference in tension might explain it, of course. I don't know whether it is adequate for all cases, though. The phenomenon is very much like looking along the line of a phonograph record. There is a peculiar break or dotting, almost a periodic dotting of the surface. It is a color difference primarily but when the eye gets close, you will see there is a physical difference in the aspect of the fiber, with almost a shattering. You might call it a phonograph message down the length of the warp here and there.

Mr. Herrmann: I think that point on tension is very well taken.

Dr. Harold: You don't think it is put on in the beaming? You think it was there before?

Mr. Herrmann: I would rather not say.

Dr. Harold: No two threads match. They are quite divergent.

Mr. Chase: I had a somewhat similar case explained to me by a man formerly with a celanese company. He said there were two causes that he knew of for it, and that was fixing rayon acetate yarn in one fabric from two different manufacturers, which was one cause, and the second was the different oil of the rayon was very likely to cause it. One oil might come off easily and the other would remain on the yarn.

Chairman Gaede: Are there any other answers to Dr. Harold's question? Dr. Coleman?

Dr. Coleman: I am not in a position to answer because I am not a dyer.

Secretary Hoppe: Do you think the application of the tint would have anything to do with it?

Dr. Harold: The original tint always comes out in cold water. It is extremely soluble.

Mr. Cohen: I would like to know if there is any resist printing done successfully? I mean print the material and then dye it afterwards.

Chairman Gaede: I am not familiar with the printing industry.

Dr. Harold: It is done on these picot tops on hosiery. You see lots of that. They are dyed in vats and then resisted and then the whole stocking is dyed with direct colors.

Mr. Cohen: No, I mean printed first and then dyed, resist printing. I am referring to silk. I suppose it could be done on cotton the same way.

Secretary Hoppe: I know a lot of it is being done on the other side in cotton but I never heard of it being done in silk in any quantity. A lot of it is done on cotton in Europe, very successfully.

Chairman Gaede: Has anyone a formula in his pocket for that?

We will give one more chance for anyone who desires to ask a question. We will be glad to hear more, if anyone has any to present. Don't be backward. This meeting was more or less of an experiment to see how it would go and I think we have brought out a great many interesting subjects and good points tonight. I think we will consider it next year and see if we want to wind up the season the same way.

Are there any more questions? If not, we will close. If there is nothing further, the meeting stands adjourned.

The meeting then adjourned at nine thirty-five o'clock.

*Report continued from Proceedings p. 244, June 22nd issue.

ANNUAL SUMMER OUTING OF THE PIEDMONT SECTION

A great deal of interest is being shown in the coming outing of the Piedmont Section, which will be held on July 11th.

The usual 18 hole medal play golf tournament, with suitable prizes for the first and second low gross and first and second low net and high gross, baseball, swimming, quoits and various and sundry other games, will be provided to make the Outing of interest to all that are fortunate enough to be able to attend.

The ladies day will be a special feature of the Outing, with a bridge party and a ladies putting contest, with beautiful prizes provided for our lady friends.

A very appetizing menu has been selected for the dinner at the Club, at 7 o'clock in the evening, and a

most unusual and different sort of entertainment has been arranged for the Banquet.

Mr. Julian Miller, will entertain us with a few appropriate remarks after the Banquet.

A dance will be held for the members and friends after the dinner is over.

Members and friends from other sections are cordially invited to join us and make reservations through the Secretary of the Piedmont Section.

The committee on Ladies entertainment include—Mrs. Chas. H. Stone, Charlotte, N. C., Mrs. L. R. Hiller, Augusta, Ga., and Mrs. R. M. Mitchell, Greensboro, N. C.

Respectfully submitted,

A. R. THOMPSON, JR.,

Secretary of the Piedmont Section.

NEW YORK SECTION OUTING

The results in golf at the outing of the New York Section were as follows: Low net, Daniel L. Clarenbach; low gross, Henry F. Herrmann, 98; second Mr. Patterson, 103. This is the second year that Mr. Clarenbach has obtained low net for the tournament.

FORM SOUTHEASTERN SECTION

On June 20th a new section of the American Association of Textile Colorists and Chemists was formed. This is to be known as the Southeastern Section. The temporary organization of the new Section took place in the Ralston Hotel, Columbus, Ga. There were about fifty men present.

Temporary officers were elected as follows: E. A. Feamster, of the Eagle and Phenix Mills in Columbia, chairman of the Section; Roddy Fields, of the Newnan Cotton Mills, treasurer, and Charles Ordway, professor of Dyeing and Chemistry at the Alabama Polytechnic Institute, treasurer. The executive committee consists of W. F. Christman, of the Russell Manufacturing Co. in Alexander City, Ala.; M. T. Johnson, of the Hillside Cotton Mills, La Grange, Ga.; Prof. C. A. Jones, Georgia School of Technology, Atlanta, Ga.; Thomas Taylor, of the Newport Chemical Co., Newnan, Ga.; W. C. Jackson, of the Lowell Bleachery, Griffin, Ga., and George Purvis, of the Bradley Mfg. Co., Columbus, Ga.

Now that the temporary organization of the new Section has been completed they will apply to the National Council of the Association for a charter. They are planning to hold three meetings a year at Columbus.

Papers were presented by: E. P. Davidson, Du Pont Co., on "Sulphur Dyestuffs"; J. C. Robertson on "Peroxide Bleaching-Zolozine"; B. C. Querm, Buffalo Chemical Co., on "Peroxide Bleaching"; and J. W. Ivery, Mathieson Alkali Co., on "Chlorine Bleaching."

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MORE ABOUT CHEMIST'S SALARIES

CHEMISTS are generally thought of as non-productive men. This is true in one sense of the word in that they do not produce goods which are sold directly to the consumer. However they are productive when we use the term broadly. They do produce actual results. But should they be paid according to the results they produce—alone? This is the method used in determining the wages of strictly productive workers. This seems, at first, a logical and fair method of remuneration. A manufacturer wants something — the chemist gives it to him—and is paid accordingly. It sounds reasonable enough but it does not work out practically. The manufacturer often wants something impossible or which is impractical to apply to manufacturing methods. Or on the other hand, the chemist may spend a long time working on a problem and, when it is finished, the value to the manufacturer may be all out of proportion to the time spent by the chemist. Thus if he is paid according to the value received, the chemist's fee would be very small in relation to the time spent. The results of the research chemist are entirely too uncertain to have his salary determined in this manner.

The other method of payment is by a flat salary. This is generally the method used in this country. If the results are invaluable to the employer, the chemist's salary is the same as if he had accomplished nothing. Of course, if he is continually producing good results, in due time his salary will probably be raised. This method of payment is undoubtedly the more acceptable to the chemist as he is thereby insured at least some return for his efforts. But in many cases the salary will be all out of proportion to the work he has done over a certain period of time.

Why not combine the two methods of payment—the one where the chemist is paid according to results produced and the other where he is given a flat salary? In many of the European countries, especially Germany, that is the scheme used. A chemist, when hired by a concern, is paid a salary based on his past work. In addition to this, if at any time he increases the profits of the concern by improving processes or discovering new products, he receives a bonus—the amount of which is determined by the value of his work. In this case, both the chemist and the employer are well satisfied. If the manufacturer can make more money he is willing to share the profits with the person who makes such a thing possible and when the chemist is amply rewarded for his efforts, he, too, is satisfied. The desire to increase his earning capacity by work which pays him well will inspire the chemist to make greater efforts to solve each problem in a manner that will increase the profits of his employer and at the same time better his own financial condition. At many times the chemist could not guarantee results on a particular case. Under such conditions he would be protected by his regular salary. When, however, results are obtained, increased compensation in the form of a bonus should be forthcoming.

As such a system of combination bonus and salary has been agreeable to both parties in European countries, the plan ought to work out satisfactorily here. The position of the chemist may be likened to that of a salesman. As a salesman sells his merchandise, so does a chemist sell the results of his years of training and experience. The salesman in most cases receives a definite salary, and in addition to this he receives a commission on all sales over a certain amount. So should the chemist receive a regular salary and an extra bonus on all work that has an increased value to his employer.

RESEARCH COORDINATION

ACCORDING to Robert F. Elder, Assistant Professor of Marketing at the Massachusetts Institute of Technology, the aim of technical and scientific research has been to "improve manufacturing methods and processes in order to reduce the costs, and hence earn a profit in the face of a forced decline in price." He further states that "a haphazard program based on occasional ideas, must give place to a soundly conceived, systematically conducted, and properly controlled policy directed at the development of new products and the improvement of processes. Such a policy is the only sound insurance against over-capacity and 'industry obsolescence'."

There is certainly a place for well organized scientific research in the textile industry. An oversupplied market has brought the price of textile products down to an exceptionally low level. Now, if ever, should technical research come to the aid of the textile industry and assist in producing profits while the price level is below normal. It is *now* that technical research may demonstrate its true worth to the industry as a whole. But scientific research which is not coordinated with market research is a waste

of both time and money. It would be a needless expense to work for weeks or months in developing a product for which there would be no market even though it could be successfully manufactured. It is impossible to create a market for something that no one wants, but it is worthwhile to try to produce an object that everyone wants. Before laboratory work is started on a search for a new product the potential market for such should be carefully investigated. There must be a large enough market for the new substance to enable the manufacturer to make a profit on his investment. Each idea should be conscientiously analyzed to determine whether it has possibilities and also whether it will merit expenditure of time and money.

Professor Elder also advises a periodical check, not only on conditions in the laboratory but also on general economic and business conditions. The element of time enters into this consideration. Work may continue at some length on a particular commodity and during that time there is a possibility of a change in market conditions and the demand for that certain product may be greatly diminished or cease entirely.

After the product has been found satisfactory in the laboratory as well as applicable to manufacturing methods, the task of the technical researcher is finished and it is up to the market research expert alone to distribute the product successfully. It is by the proper coordination between both groups of research workers—the marketing and the technical—that the investigations of each group will be profitable to the employer.

EDITOR'S NOTE

Mr. O. L. Evenson, associate chemist of the Color Certification Laboratory of the Bureau of Chemistry, has called our attention to the fact that several corrections and revisions should be made in the article entitled "Foodstuff Dyes and Their Detection" by Fred. Grove-Palmer as published in the April 13 edition of the AMERICAN DYESTUFF REPORTER.

Ponsol 4R which is listed as one of the food dyes permitted in this country should be omitted from the list.

Yellow AB and Light Green SF Yellowish which it states are not permitted are at the present time upon the list of those which may be used for food coloring.

In order to complete the list of coal tar food dyes permitted in the United States at the present time there should be added:

Fast Green FCF
Brilliant Blue FCF
Ponceau SX
Sunset Yellow FCF

New Development

Laurel Delustro is a new development of the Laurel Soap Manufacturing Company, Philadelphia, which has proven satisfactory in delustering silk hosiery. This product is said to be very easily used, and the results obtained are claimed to be exceptional. The process is considered very brief.

Upholstering

Further evidence of the wide range of fabrics offered for upholstering purposes is contained in a report of the testing laboratory of a nationally known seating company where special apparatus has been installed to determine the wearing qualities of various materials.

Samples of fabrics are placed in a machine which subjects them, in a limited time, to usage equivalent to what they would receive under actual service conditions. The tests enable investigators to rate the materials according to "wear numbers" which indicate how well they withstand the rubbing in the machine.

Albert F. Musgrave

Mr. Albert F. Musgrave, chief chemist in charge of application laboratory and warehouse department of American Aniline Products, Inc., New York City, died recently after a short illness.

Mr. Musgrave was well known throughout the dyestuff and textile industry. He descended from a line of dyers and colorists, as well as dyestuff men. He rose to his recent position through his untiring efforts and ability. He was extremely studious and well known for his loyalty to his employers.

He was a graduate of Lowell Textile Institute, year 1908. His first position was with the Kalle Company from 1911 to 1913, after which he spent one year with the Buffalo Dye Works in Philadelphia, working under his father, the late Albert Musgrave, Canadian representative of the Ciba Company. Soon after he returned to the Kalle Company from 1914 to 1918, and then spent two years with Essex Aniline Works. In 1920 he joined the American Aniline Products, Inc., where he made an enviable record until the day of his passing.

He was a member of the American Association of Textile Colorists and Chemists.

Fred Grove-Palmer

It is with deep regret that we learn of the death of Fred. Grove-Palmer, A.I.C., of London, England. He was a well known scientific and technical journalist and many of his articles have appeared in SILK and in the AMERICAN DYESTUFF REPORTER. He has also written for technical magazines which are published in England. He was taken suddenly ill with appendicitis and did not recover from the ensuing operation. He will be missed by many of his friends in his own country and here. He is survived by his wife.

Chemical Engineering Aspects of the Textile Industry—

(*Continued from page* 419)

mist of water into the room. In the second type an electric motor drives at high speed a disk on which falling water is broken up into fine mist. This type of equipment has a relatively high capacity and is employed where the head room is considerable. The turbo type works well for either high or low head room, but is especially adapted to the latter instance.

The large majority of textile plants employ some make of head-type equipment. In all cases where good operating methods are required, automatic regulation is installed. The equipment is of relatively little use otherwise.

Dehumidification is not used in textile operations. In some textile testing laboratories it is, of course, employed with central station type humidification where absolutely exact regulation of both temperature and relative humidity is required under all conditions.

IV. Evaporation

The use of evaporation in the textile industry is rare. In the case of large cotton mercerizing plants, however, where the consumption of caustic soda is sufficient to justify it, evaporators are employed. Customarily, they are either triple or quadruple effect.

V. Refrigeration

Refrigeration is another chemical engineering process which is rarely required in textiles. In cotton mercerizing refrigerated caustic soda solutions are employed in some plants. The effect obtained is somewhat different from that derived when warmer caustic solutions are used. The concentration of alkali required for a given effect drops rapidly as the temperature is lowered.

An interesting instance of the use of refrigeration is found in the Heberlein process for the low-temperature treatment of cotton cloth with caustic soda. In this process, cotton cloth assumes a permanent linen-like effect which cannot be destroyed even after repeated washing and long wear. The temperatures employed are far below those for a so-called low-temperature mercerization.

VI. Heat Flow and Flow of Fluids

There are in the textile industry no problems involving the flow of heat which are not similar to those encountered elsewhere. The same may be said in regard to the flow of fluids.

The recovery of heat from waste dye or boil-off liquors is determined upon and, if necessary, put into effect by the use of interchangers, as in other industries. It might be said, however, that textile mills as a whole are wasteful of hot water and that the use of heat-interchangers is not so general as it should be. Of course, it is common practice to float automatically regulated hot-water reservoirs on the boiler lines to care for peak loads; and all well-run mills which require much process steam utilize bleeder turbines or their equivalent. The cost of coal and power is very heavy in textile operations and much work along engineering lines remains to be done for nearly all the smaller units.

VII. Major Problems for the Chemical Engineer and Chemist

It is somewhat venturesome to attempt to lay out the fields in which scientific and engineering work appears to be needed in the textile industry, but a few of these are listed below:

1. An economical method of recovering wool-grease residues from scouring liquors. At present the only useful by-product is lanolin, which enjoys a most restricted market. The value of the residues for fertilizer does not repay the cost of recovery under present methods. Legislation against stream pollution, however, may force this issue without regard to the economics of the case.

2. Work should be done to determine whether useful by-products cannot be derived from wool scouring residues. At least 150,000,000 pounds of such residues are annually discharged to waste in the United States.

3. The dyeing of cotton, wool, rayon or silk in the piece is generally a rapid process. Dyeing yarn and raw-stock are time-consuming processes.

Means for speeding up the dyeing cycle for yarns and raw-stock would result in very large economies.

4. Quicker means than those generally employed for boiling-off cotton cloth before bleaching and dyeing should be introduced.

The removal of the waxes and gums natural to cotton fibers and of motes must be accomplished in order to assume even bleaching and dyeing. Common practice is to "boil" the cloth or yarn under pressure in kiers holding up to 10,000 pounds of material for from 4 to 16 hours. The chemicals used are soda ash with or without soap or "soluble oils" as assistants. Tri sodium phosphate is also used. The general use of a good continuous process to replace the cumbersome and costly kier-boiling is greatly to be desired.

5. A good continuous dyeing process for all raw-stock fibers would be advantageous. Only one such machine has ever been made to work successfully and this has so many difficulties connected with it that its use can hardly become general.

The above represent a few general suggestions as to problems requiring attention. Primarily, on dyestuffs, chemicals, and new processes or finishes, the most important problems are chemical. The influence of chemical engineering control, however, to a greatly increased degree would result in major economies in nearly any mill and on any of the above items.

Developments in Dyeing with Azoic Colors

(*Continued from page 420*)

the Naphthol baths and generally tends to lower the fastness to rubbing.

Opinions on the ease with which the various Naphthols may be brought into solution appear to vary considerably. It will vary with the different Naphthols, of course; but apart from that I find that in many cases it is considered a troublesome operation, to say the least. It is, of course, essential to use soft water. Care in the initial pasting is very desirable; first of all work the Naphthol to a thin cream with T.R.O. or, say, Perminal and a little hot water, followed by the necessary caustic soda, which must not be added until the cream is quite free from lumps. At this stage it is generally advisable to allow the paste to stand for about 20 minutes, when, in the majority of cases, it has set to a semi-hard mass. A little stirring, particularly with the addition of a small amount of hot water, easily forms a smooth paste, then boiling water is added to obtain a clear solution.

Condition of Naphthol Bath

I wish to stress the words *clear solution*, because it is so very important that the Naphthol baths should be in good condition if the clearest and cleanest dyeings are to be obtained. Your Naphthol is the foundation, so to speak, on which the dyestuff is built, and unless it is well and evenly laid the final structure will not be stable. Even if your coupling or developing baths are perfect in every respect, it is of no use unless the material is properly Naphtholated.

Where standing baths are employed it is essential to keep a very close watch on the condition of the liquor. Baths which are beginning to show signs of becoming muddy should be corrected, either by a little caustic soda or by warming, remedies which can be conveniently tried beforehand, by using a small sample of the liquor. If the baths cannot be corrected, it is really cheaper in the long run to let them go, otherwise extra time and trouble, with possible complaints regarding the dyed materials, will result.

Where possible, formaldehyde should be used, as it has a favorable influence on the stability of the Naphthol solutions, and the goods are then not so liable to be affected by hydro-extraction or "airing" in the wet state.

In so far as the actual manipulation of the material is concerned during padding or Naphtholating, the method employed must, of course, vary with the type of goods and the machinery at one's disposal. For piece goods, naphtholating on the jig is probably the most efficient method. A run of 6-8 ends is advisable, although it may be necessary in the interests of production to bring this down to 4 ends. In yarn dyeing there are numerous methods of handling the material, but I would say that the best results are obtained when the conditions allow of working in a liquor of about 20:1, for a period of about 20-30 mins. It may be accepted as a good working rule that the slower the padding operation the better the penetration and evenness of the Naphtholating. The squeezing or hydro-extraction after Naphtholating and before padding is very important for the production of shades possessing maximum rubbing fastness, with minimum clearing operations.

Superfluous Liquor

Under all the normal conditions of Naphtholating, the fiber contains the Naphthol in two forms:—

(1) That which is actually combined with the fiber.
(2) That which is present in the superfluous Naphthol liquor.

From the theoretical point of view, one does not want any superfluous liquor present, as the resulting insoluble dyestuff which is formed will not be intimately combined with the fiber but will be present as a superficial pigment. It is that superficial pigment which is largely responsible for poor fastness to rubbing and soaping treatments. For all types of cotton goods, the maximum hydro-extraction or degree of squeezing should be given. In the case of piece goods, I think most of you with experience of these colors will agree that drying after Naphtholating is very desirable. During the drying the superfluous liquor is evaporated, leaving the residual Naphthol combined within the fiber.

I use the word *combined* to describe the physical combination of the Naphthol with the cotton fiber, in just the same way as a direct dyestuff is absorbed by cotton materials.

It is perfectly correct to assume that the cleanest dyeings can be expected from those Naphthols possessing the best degree of affinity for the fiber.

A Brine Wash

Washing with brine after Naphtholating has received some attention and it is a very useful treatment. It does, of course, slow down production by introducing an additional process and also results in some loss of Naphthol. Those Naphthols having a low degree of substantivity or affinity cannot be treated in this way, and, unfortunately, those are just the Naphthols for which the method would be most valuable. As I have already mentioned, the substantive Naphthols are the least troublesome, in so far as removal of superfluous liquor is concerned.

In drying piece goods after Naphtholating, one can employ the hot flue or the drying range. The former method is not generally used, but is to be recommended for goods containing artificial silk. It is very desirable when drying

on cans to avoid early contact with very hot tins. It is preferable to have the first section of the range connected with a separate steam supply, so that the temperature can be kept lower than is usual.

Coupling in Open Beck

When coupling yarn in the open beck, I always feel more confident of good results—or, shall I say, of avoidance of unnecessary trouble—if each stick is given a turn when entered and the whole batch not allowed to be "set up" before commencing the turning.

For piece goods the coupling operation is generally fairly straightforward, but there are exceptions which are peculiar to the individual products. It is often desirable, particularly for heavily-woven piece goods, to give a good nip after the cloth has passed through the diazo solutions, in order that the liquor may be forced well into the fabric, thus obtaining full penetration. These conditions are obtained on the padding machine, which is very popular for developing. In those cases where the base used is slow in coupling the jig is to be preferred to the pad. After coupling on the padding machine it is very desirable to give an air passage, in order that the coupling may proceed to completion before rinsing.

It is important to note that although coupling may appear to be instantaneous whilst running through the diazo solution, it actually requires two or three minutes to obtain complete combination between the Naphthol and the base.

Clearing and Soaping

After the coupling, we come to an extremely important part of the dyeing process, on the efficiency of which the quality of the finished material very largely depends. I refer to the clearing and soaping treatments. When the material leaves the developing bath, it contains excess diazo solution and mechanically adhering pigment. The former can be fairly readily removed by rinsing in cold water, to which it is advisable to add a little hydrochloric acid. A further cold rinse is given to remove the acid, followed by a rinse in hot water, to which a little soda ash may be added, and finally a soaping at the boil. It is usual to add soda ash to the soap boiling bath.

The object of the soap bath is twofold:

(1) To remove the mechanically adhering pigment;

(2) To develop the true shade.

The fastness to rubbing is very largely determined by the efficiency of the soaping treatment, assuming that the precautions already mentioned in connection with Naphtholating have been observed. The most important factor in soaping is maintenance of temperature. The bath must be boiling. A temperature of 90-95 deg. C. is definitely much less efficient than 100 deg. C. One efficient treatment for, say half an hour gives better results than when one tries to obtain results by increasing the time or giving a double soaping using lower temperatures. During soaping it is advisable to give the material as much mechanical treatment as possible.

One often hears that laboratory dyeings of azoic colors are superior in rubbing fastness to those obtained in bulk. The reason for this is quite obvious. In the laboratory one can rinse and soap with far greater ease and efficiency than on the large scale. There is no difficulty in maintaining the soaping bath *and the material* at a temperature of 100 deg. C. On the large scale, I know, it is very difficult. However, the position is quite clear, and the least one can do is to use every practicable means of maintaining the highest possible temperature when soaping.

Aggregation of Particles

I want to make a few comments on over-soaping, which can be brought about by prolonged treatment at, or below, the boil. The pigment on the fiber is in a certain physical form before soaping, and it can be considered to be distributed as a solid uniform mass throughout the cotton fiber. When this is subjected to high temperatures the physical form tends to undergo a change and, instead of being a solid mass, uniformly distributed, it begins to break down into small particles. This is generally described as aggregation of color particles and is similar to the formation of crystals from concentrated solutions of chemical substances. This change in particle size is most probably—and I wish to speak guardedly on this point—the reason for the numerous cases where the difference between the soaped and unsoaped shades is very considerable.

Photograph of cotton fibres, magnified 750 times), illustrating the aggregation of color particles. The dark band on the left is the normal carefully shaped shade of 2-chlor p-aniside of b-hydroxynapthoic acid + 4-chloro m-anisidine. The light speckled band on the right is the same soaped dyeing subjected to a severe alkaline boil. The actual color crystals can be seen quite clearly.

In order to obtain the maximum fastness to rubbing and full development of shade, it is necessary to cause the aggregation of color particles to proceed just so far and no further. In other words, there is a definite point of balance. If aggregation proceeds beyond this point the color particles begin to wander or drift to the outside of the cotton fiber, with the result that a surface pigment is formed which will rub off fairly easily. By giving a continued soaping you will continue to remove color and may be under the impression that it is superfluous pigment when it is nothing of the kind and is the color you wish to retain on the fiber.

Ease of Aggregation

The ease with which the aggregation takes place varies with the different Naphthol combinations, and has been carefully studied by Prof. F. M. Rowe, of Leeds University. Some very interesting papers have been published by him (*Jour. Soc. Dyers and Col.*), and I would strongly recommend anybody who wishes to become fully conversant with this phenomenon to consult them.

It is, of course, necessary to use the microscope in order to see this aggregation effect.

To conclude my remarks on application, I should like to say that the soaping treatment contributes towards maximum light fastness. By varying the degree of severity of the soaping bath it is possible to get gradations of light fastness.

I now want to tell you something about two additions to the range of azoic dyestuffs which have recently been put on the market by the I.C.I.

The first product I wish to deal with is a new Naphthol, marketed under the name of Duratol BA. This Naphthol belongs to the same class of compounds as Naphthol AS, TR, AS.OL, etc., marketed by the I.G., and is applied in the same manner.

Assessing Value of Naphthol

In assessing the value of a Naphthol, one approaches it from two different angles. First, one considers it from an application point of view, and points such as solubility, affinity and ease of application come into consideration. So far as this viewpoint is concerned, Duratol BA is a very interesting product. It is quite readily soluble, giving clear solutions of good stability and, of course, is quite satisfactory from a levelling point of view. It possesses good substantivity, with a result that, generally speaking, the shades obtained compare favorably with those of the other members of the azoic range as regards fastness to rubbing.

Duratol BA is sufficiently substantive to be given a brine rinse after impregnating the material and before coupling. Regarding the shades obtained, the tinctorial value is good, whilst the majority of the hues are noteworthy for their brilliancy and purity.

When considering any new product one must, of course, also think in terms of the particular combinations which are obtained. Generally speaking, a Naphthol is of interest on account of, shall we say, five or six specific combinations, or, maybe, more. It is, of course, possible to combine any Naphthol with any of the available bases, but usually the interest for regular work will be limited to five or six couplings. The textile requirements of azoic colors can be divided into two classes. The color is wanted:—

(1) For those purposes where some specific fastness is necessary: for example, light, washing or bleaching;

(2) Where the shade is of first importance and a reasonably good all-round standard of fastness to light or washing is sufficient.

Duratol BA Combinations

I wish to deal with those Duratol BA combinations which belong to the first of the above-mentioned classes, namely, for specific fastness properties.

Duratol BA—Fast Orange GR.—This combination is of interest for its very good fastness to light. Using the scale of light fastness 1-8, it could be described as a 7, and it is specially valuable for all purposes where light fastness if of first importance, particularly for piece goods.

Duratol BA—Fast Red KB Base.—This combination is of exceptionally good fastness to kier boiling and of good fastness to light. It is very suitable for yarns, warps, cops, etc., which are to be subsequently woven with undyed cotton and piece bleached. I wish to make it quite clear that in speaking of kier boiling I am referring to the methods adopted for bleaching material such as shirtings, etc., for which fabrics an open kier boil is always used.

Duratol BA—Fast Red 3GL Base.—This combination is of special interest for piece dyeing, as it gives a red which could be described as very popular and of a tone which is always found in a dyer's standard range of shades. It possesses very good fastness to light and, although I cannot claim it to have a light fastness of 8, it could certainly be described as a very good 7.

Duratol BA—Fast Scarlet RC.—This combination is mainly of interest on account of the beauty of shade. Bright bluish rose shades which reduce down in light shades to brilliant pinks are obtainable. It has already received considerable attention for use in the dyeing of yarns of warps for the towelling trade. It is quite satisfactory for the bleaching process as applied to colored goods. The fastness to washing of all these combinations is very good.

[Having dealt with Duratol BA combinations of specific fastness, Mr. Blackshaw showed dyed samples to illustrate the beauty of color of these. He also displayed examples of Duratol BA combinations of value on account of their shade alone.]

I should like to mention the value of Duratol BA for dyeing viscose rayon. The shades obtained are very bright and of good tinctorial value. A point of extreme importance is that they have excellent all-round fastness to hot soaping treatments.

Color Aggregation on Viscose

I have already told you about the phenomenon of the aggregation of color particles. This is known to take place much more readily on viscose than on cotton. Generally speaking, viscose dyers have to use a soaping after-treatment at not above 60 deg. C., otherwise there is a distinct risk of the color blinding. Red shades which are reasonably clear before soaping may very easily be turned into what is known as a sealing wax effect. Duratol BA combinations are found to resist soaping treatments very well and, with the exception of one or two combinations, may be soaped at 80 deg. C., if desired. The combination of Duratol BA with Fast Red KB has been found to possess very good fastness to bleaching and desulphurizing.

To conclude my paper, I want to say something about the new azoic green which has been recently placed on the market by Imperial Chemical Industries.

I do not think I am strictly correct in using the word "new" in connection with this product, as something which hitherto has not been in existence is more than new. The failure to obtain a green by means of azoic colors has been one of the technical problems of the dyestuff industry during the last fifty years, and may be considered to date from the first use of ice colors in 1880, when Read Holliday introduced the well-known Para Red process.

From a color-making point of view, the production of

a green in this series of dyestuffs is exceedingly difficult and as an example of British research the fact that the problem has been solved is deserving of a very prominent position. It is a very curious thing that in the majority of dyestuff ranges (classified chemically) greens always seem to be very scarce, except in the basic range. If you trace the chemical history of all the various dyestuff groups you will find that the green is pretty nearly always one of the last to be discovered. It would seem almost as though Nature being prolific in green so far as her own realm is concerned, guards her secret jealously and resents the efforts of mankind to imitate her.

Properties of Duratol Green

Duratol Green G salt is a stabilized diazo compound, which is simply dissolved, added to the dyebath in conjunction with a suitable "alkali binding agent" and is ready for use. It gives bright yellow green shades with Naphthol ASG (I.G.) which build up readily to deep, rich bottle greens. The shades obtained possess excellent fastness to washing and boiling, to acids and alkalies, cross dyeing, ironing and perspiration.

The fastness to light may be described as good to very good, although I must not give that opinion as definitely conclusive, in view of the fact that this color is so new that the investigation of light fastness is not finally complete. I can, however, say quite definitely that it is much better in this respect than direct cotton greens or a sulphur color combination, which, to obtain a similar shade to Duratol Green G, must include a yellow. I can be definite on the fact that it could not be used, for example, in piece dyeing for materials such as curtains, casement cloths, etc., where a high standard of light fastness is essential.

Combination with Naphthol ASG

The combination with Naphthol ASG is very suitable for the production of greens on yarns and warps to be used for linings, colored towellings, bed ticks, table cloths, bedspreads, etc., as well as for all cases of goods on which a color of high standard of fastness to repeated laundering is necessary. The good fastness to cross-dyeing and perspiration makes Duratol Green G of special interest for goods to be used in the production of high-class union materials. It gives particularly rich green shades on viscose silk.

One point to bear in mind in connection with this class of dyestuff for viscose is that they give quite even shades on material of irregular quality. For light and medium shades it is a distinct advantage to have at one's disposal a method of producing green shades which will be unaffected from this defect of irregularity in the material itself.

There are one or two points I should like to raise in connection with the application of Duratol Green G salt. It is somewhat slow in speed of coupling, and I recommend in all cases that sufficient time of immersion be given, to allow of full coupling. It is not recommended for developing yarn in the tub, or in the liquoring machine, nor for piece goods developed by the pad method.

A feature of Duratol Green G that is of considerable interest is the particularly good stability of the developing bath. It is possible to develop at temperatures up to about 40 deg. C. without any danger of the bath decomposing which is a very valuable property, as the high temperature enables maximum penetration to be obtained, and also largely contributes to overcoming the possible defect of slow coupling.

Open House Day at Lowell Textile Institute

As has been the custom for several years, the Lowell Textile Institute recently threw open its doors to the public for an afternoon and evening so that a thorough inspection might be made of the institution's extensive equipment in active operation

In the *Cotton Yarns Department* cards, combs, fly frames, ring frames, a mule, winders and twisters were all being run to demonstrate the sequence of operations and to show what happens to cotton as it progresses through the mill. Samples of various yarns and unusual products made of cotton were shown in cases and in the class room.

In the *Department of Wool Yarns* the principles of woolen and worsted manufacturing were demonstrated, involving both the Bardford and French systems. Wool was displayed in the fleece and through the multitudinous avenues of manufacture up to the one hundred and one uses found for this valuable textile fiber. Woolen cards and mules were making yarns. The worsted processes of gilling, combing, backwashing, drawing and spinning used in the Bradford system were in operation, while other machines on similar work demonstrated the French system of manufacture.

In the *Knitting Department* a wide range of circular machines for hosiery, underwear and outerwear fabrics were in operation. Static displays of knitted garments and fabrics made it possible to see and feel materials such as were being knitted. A considerable variety of knitting yarns were prepared on special tubes, mounted to show comparative appearances. The samples included various worsteds, durenes, rayons and silks. Steps in the manufacture of Bemberg DuPont, Viscose and Industrial yarns were illustrated with a series of samples of each.

The *Design Department* had an excellent display in the weave room, which was in full operation. Every loom in the department was running at some time or other during the day. This included the weaving of blankets made from high grade virgin wool, women's dress goods, cotton, rayon and wool mixtures, flannels, carpeting and men's shirtings. The jacquard ribbon loom was in action most of the day making ribbons with the State seal upon them. The Universal winder was also in operation which showed, in conjunctio. with the high speed warper, this new method of warping.

The finishing department laboratories were open, with various machines in operation. The work of these laboratories included finishing of cottons, linens, woolens and worsteds.

A variety of cloths were on exhibition showing various types of finishes as obtained with different sequences of operations or different treatments in the same sequence of operations.

In the *Experimental Dyeing Laboratory*, methods of dye testing were illustrated by actual tests in operation, and by a large display of sample cards which recorded the degree of fading effected under many different conditions. In the practical dyeing department full sized machines were in operation for showing methods of dyeing cloth, yarn, and raw stock.

A *rayon spinning unit* was in operation and a viscose solution was being spun into yarn by the regular method used in the large rayon plants. The machines and processes used in preparing the viscose solution were also illustrated.

In the *Organic Laboratory* there was a display of the methods used for manufacturing organic compounds including dyestuff intermediates and dyes.

A number of students working in the *Quantitative Laboratory* demonstrated the analytical methods of testing the various products used by textile manufacturers.

The *Experimental and Research Laboratory* exhibited a number of viscosimeters and other oil-testing apparatus, surface tension and drop number apparatus for testing detergents, pH apparatus, extraction apparatus, conditioning and drying apparatus.

The *Microscopy and Photomicroscopy Laboratories* had an exhibit of fibers and fabrics under different magnifications, various types of microscopes and accessories, and a display showing all the steps in the preparation of rayon cross-sections. Dye-testing apparatus, including colorimeters, tintometers, color matching lights, and ultra violet light phenomena were also shown as well as a Fadeometer and Launderometer for measuring dye fastness.

In the *Microbiological Laboratory* were shown different types of micro organisms which attack fibers. These were shown both on the fiber and in pure culture. A culture of living bacteria under the microscope attracted most attention. The usual apparatus for carrying on work in microbiology was also on display. This included the incubator, the autoclave, petri dishes and other culture apparatus.

The *Inorganic Laboratory* displayed reciprocal combustion, spontaneous combustion, a glass model of a Chamber Process of Sulfuric Acid Plant. At intervals a thermite reaction was set off.

Medal Awarded

The medal awarded annually by the National Association of Cotton Manufacturers to the member of the graduating class at North Carolina State College who has done the most proficient work in the Textile School, was presented to H. H. Rankin, Gastonia, N. C., by Walter C. Taylor, Secretary and Treasurer of the Southern Textile Association. He gave a short history of the National Association and the influence exerted by this Association on the textile industry.

Commencement at Lowell

The thirty-third commencement of the Lowell Textile Institute was held in Southwick Hall in Lowell on June ninth, nineteen thirty-one. There were twenty-nine students in the graduating class. Nineteen students received the degree of Bachelor of Textile Chemistry from the Chemistry and Dyeing Department, six received the degree of Bachelor of Textile Engineering from the Engineering Department, one received the diploma from the Department of Cotton Manufacture, two received the diploma from the Department of Wool Manufacture, and one received the diploma from the Department of Textile Design. The diplomas were presented and the degrees conferred by President Charles Eames. The speaker at the exercises was David D. Vaughan, A.M., Professor of Social Ethics at Boston University. The subject of his address was "The Challenge of the New Day."

The following awards were made:

Medal of the National Ass'n of Cotton Manufacturers. Presented by Russell T. Fisher, Secretary, National Ass'n of Cotton Manufacturers

To John Ervin Peary—(Wilton, Me.)

Louis A. Olney Book Prizes (in the form of books): $20 to the regular student in the Chemistry and Textile Coloring Course who shall present the best thesis preparatory to graduation.

To Ralph Edgar Hale—(West Newbury, Mass.)

$10 and $5 respectively to the students taking the regular Chemistry and Textile Coloring Course who shall be considered as having attained the highest and second highest scholarship in second and first year Chemistry:

Second Year

First Prize: Raymond Lewis Matthews (Gardner, Mass.)

Second Prize: Gerald Adelbert Robillard (Lowell, Mass.)

First Year

First Prize: Robert Joseph Thomas (Lowell, Mass.)

Second Prize: Robert Theodore Graham (No. Andover, Mass.)

Honorable Mention

Kenneth Everett Leslie (Haverhill)

Leon Eugene Moody (Lowell)

The Textile Color Card Association Scholarship

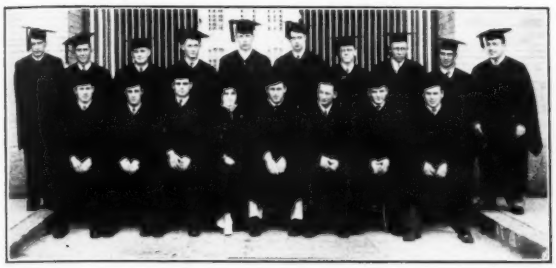
For the purpose of promoting interest in color harmony and color blendings for textile material, this association offers a scholarship providing free tuition to the student who at the end of his sophomore year has shown the greatest progress in color appreciation and application

To Edward Lucian Golee—(Lowell)

The following students are eligible for membership in Tau Epsilon Sigma, the scholastic honor society, on the basis of their standing for the first three years.

namely, a general average of 80 each term and no failures:

Leo Gleklen (Lynn, Mass.)
Stanley Squire Hockridge (North Adams, Mass.)
Lorne Fernley Howard (No. Chelmsford, Mass.)
Francis Gerard McDougall (Lowell, Mass.)
Herbert Eugene Meinelt (Lawrence, Mass.)
Joseph James Pizzuto, Jr. (Pittsfield, Mass.)



Department of Chemistry Graduates, Lowell Textile Institute

The Textile Colorist Medal

The Textile Colorist Gold Medal offered in the Textile Chemistry, Rayon, and Dyeing Division of the Clemson College (S. C.) Textile School this year has been awarded to Roy Lee McGee, B.S., of Belton, S. C., for general excellence of work, special effort, and high grades.

The Textile Color Card Association Scholarships

Norman Irving Fridlington has been awarded the scholarship established by the Textile Color Card Association at the Philadelphia Textile School, it was announced by Dr. E. W. France, director of the school, at the commencement exercises held recently.

Dr. Pierce Lectures to Textile Students

On May 28th Dr. E. W. Pierce of the Ciba Company, Inc., New York and Basle, Switzerland, delivered a very interesting and instructive lecture to the Textile students of North Carolina State College, on the subject of "Color and Its Application to the Textile Industry." This lecture was in continuation of the policy of State College Textile School in obtaining speakers representing various phases of the textile industry to address students during the school year.

During the past year the Ciba Company presented to the Textile School a full line of their dyestuffs which were imported especially for the School from their works in Switzerland.

General Release

The General Dyestuff Corporation releases Celliton Fast Blue R Powder, which it recommends for dyeing and printing acetate silk. It is said to give fuller sky-blue shades than were so far obtainable with other Celliton colors. This product is rated by the company as very good to light and washing.

Model 5C

The dye specks in piece goods and yarns, caused by the improper dissolving of the dyestuff, are said to be easily eliminated by the use of the "Baby Whale" Model 5C, a machine designed and manufactured by Herbert Hinckley, Inc. of Charlotte, North Carolina.

This model automatically mixes at the rate of three gallons per minute solvents and dyestuffs. It is portable and may be mounted to mix from a tank, a drum, or a pail. It is said to handle both thick and thin materials equally well. It is motor driven.

With this machine it makes no difference whether paste or powder dyes are used, as it actually grinds the water and the dye together, which, it is claimed, will prevent dye specks.

New Methods of Finishing

A new method of finishing marquisette curtains whereby they retain their crispness even after repeated exposure and washing, has been perfected by the Bellman-Brook Bleachery of Fairview, N. Y. It is known as the Belmarque finish and is a chemical treatment of the yarn which gives it the necessary crispness and permanently seals the fiber down in the yarn without the use of starches. Vat colors, fast to light and water, are used in the dyeing process.

Fall Season Card

The 1931 Fall Season Card has just been issued to members, it was announced recently by the Textile Color Card Association.

Seventy-six colors are portrayed on the new card which, in addition to the fashionable shades for daytime wear, highlights three special groups captioned "French Colonial Colors," "Silent Shades" and "Petits Fours."

Indigosol Blue AGG

This dye is recommended by the Carbic Color and Chemical Co. for the dyeing of acetate and pure silk. The fastness properties are described in a circular issued by the company. It is said that level and well penetrated shades are obtained by padding.

John H. Giles

John H. Giles of the Giles Dyeing Machinery Company, Frankford, Philadelphia, Penna., passed away suddenly at his home in Germantown on June 8th, 1931. Mr. Giles is survived by his wife, Elizabeth C. Giles, and by three children: Donald M., Doris L. and John M.

Mr. Giles was born in Rockport, Mass., on March 25, 1856, but later on went to Amsterdam, New York, and became associated with his uncle, John MacFarlan, in the knitting business in which concern he became a partner and the concern was then known as MacFarlan & Company. From 1908 until 1913 Mr. Giles was general manager of the Klauder-Weldon Company and in 1913 he left that concern to go into business for himself in the manufacture of dyeing machines, which business he was engaged in at the time of his death.

New Dyestuff Corp.

The plant, machinery and mixed property of the Palatine Aniline & Chemical Corporation, which was sold at a foreclosure sale on May 11, 1931, and purchased by a syndicate of Poughkeepsie business men, now is operating as the Poughkeepsie Dyestuff Corporation.

Burton Stokham, formerly Vice-President and Manager of the Palatine Aniline & Chemical Corporation is Secretary-Treasurer and Manager of the new concern.

Sales and service will be supervised solely from the Poughkeepsie office

A.S.T.M. Elects Officers

Announcement is made of the election of the following officers of the American Society for Testing Materials for the ensuing year: President, Frank O. Clements, Technical Director, Research Laboratories, General Motors Corp., Detroit; Vice-President, Samuel T. Wagner, Consulting Engineer, Reading Co., Philadelphia, Penna.; Members of Executive Committee, Arthur W. Carpenter, Akron, Ohio; Kenneth B. Cook, Pawtucket, R. I.; J. B. Johnson, U. S Army Air Corps, Wright Field, Dayton, Ohio; George C. D. Lenth, Chicago, Illinois; and O. L. Moore, Chicago, Illinois.

International Congress for Testing Materials

The first International Congress of the New International Association for the Testing of Materials will be held this year from September 6 to 12 in Zurich, Switzerland, in the buildings of the Swiss Federal Polytechnicum. The Association consists of individuals and companies in the various countries. In the United States, the national association through which contacts are established is the American Society for Testing Materials and many of its members belong to the international body.

The objects of the Association are to secure international cooperation, exchange of views and experience in regard to all matters connected with the testing of materials. The chief means of securing this result is the holding of periodical International Congresses at intervals of from three to five years. The work does not involve standardization of materials, which is one of the chief functions of the A.S.T.M.

Hungerford & Terry, Inc., Clayton, New Jersey, are sorry to announce that D. R. Weedon, who has been connected with them in their Boston office for four years, has severed his connection.

H. R. Myers, for the past six years chief engineer of the company, has taken charge of the New England territory to continue the company's past service to the many New England customers.

The Boston office will remain at 53 State St., room 440.

The Arkansas Co., Inc., of 233 Broadway, New York City, have changed their telephone number to COrtland 7-6027.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

POSITION WANTED

SALES EXECUTIVE, chemical training, member Chemical Societies, twelve years' experience in marketing, for past several years in charge distribution over wide areas, desires to locate in Eastern United States. Available September 1st. Interviews can be arranged after August 1st. Address Box 681, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED

Superintendent of a southern bleaching and finishing plant, experienced in the bleaching, dyeing, mercerizing and finishing of cotton fabrics, is resigning and desires a connection with a plant doing similar work. Full particulars and first class references furnished upon request. Box 680, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED

DYER—Six years' experience at bleaching and dyeing wool, cotton, jute and union raw stocks and yarns. Thoroughly experienced in all stages of carpet manufacture. Age, 26; married. Address: Classified Box No. 676, American Dyestuff Reporter, 440 Fourth Ave., New York, N. Y.

POSITION WANTED

Secretary-Stenographer, 8 years' experience with importing and domestic Chemical and Dyestuff manufacturing concern, desires a position in similar capacity. Address Classified Box No. 679, American Dyestuff Reporter, 440 Fourth Avenue, New York, N. Y.

POSITION WANTED

Fifteen years' experience in dyeing and printing piece goods. Formerly connected with three of the largest finishing plants in the industry. Will consider position as demonstrating salesman. Satisfactory references. Available July 15th. Box No. 678, American Dyestuff Reporter, 440 Fourth Avenue, N. Y. C.